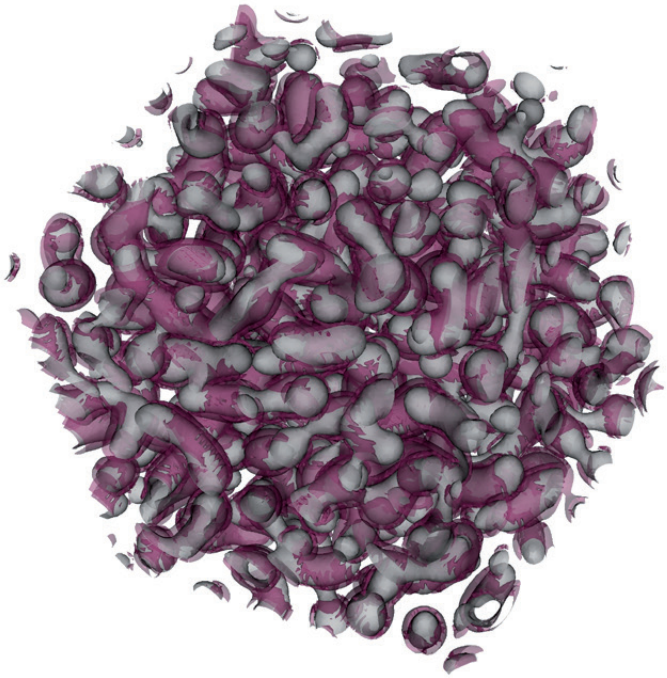
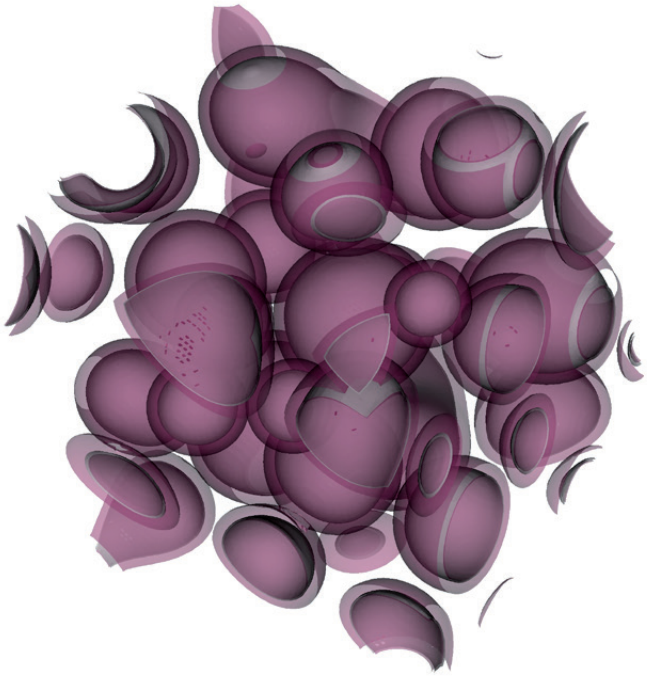
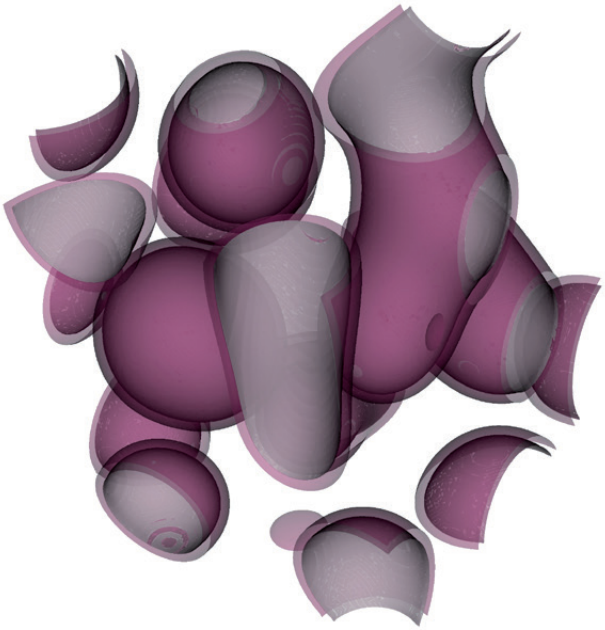





Annual Report 2012
Ugelstad Laboratory

NTNU – Trondheim
Norwegian University of
Science and Technology

Founding members

• Akzo Nobel Surface Chemistry	
• Champion Technologies	
• Wärtsilä Oil and Gas Systems AS	
• Institute for Energy Technology	
• Paper and Fiber Research Institute	
• Shell Technology Norway	
• Statoil Petroleum ASA	
• Total	

Affiliated members

• Aker Solutions	

Photo front page:
The image shows the surfactant distribution on emulsion droplets in a decaying, turbulent flow field. The surfactant reduces the coalescence rate between the droplets due to the Marangoni effect.
(Courtesy Roar Skartlien).

Annual report 2012 for Ugelstad Laboratory

Table of Contents:

1.0 From the Head of the Laboratory

2012 was a year of substantial progress at Ugelstad Laboratory. The year was marked by intensive project work. This was possible since all projects were inn at full strength. No larger new projects were started up during the year.

A special occasion was UL-10 years anniversary, where we arranged a seminar day for previous students. The arrangement was successful and the get-together of the former students, (presently established industry researchers) was spontaneous and the atmosphere was warm and genuine. The dinner was highly appreciated.

2012 also marked some changes in the tenured personnel. We had two full-time professors (Johan Sjöblom, Head of the Laboratory, and Gisle Øye). Associated Professor Wilhelm Glomm informed us that he will resign from his position to take up a senior adviser position at SINTEF. Brian Grimes continued as associate professor. Signe Håkonsen resigned from her position as laboratory technician and was replaced by May Grete Sætran, who also on temporary basis will replace laboratory manager Camilla Dagsgård when she is on maternity leave. We welcome May Grete on board.

In the laboratory activities the Adjunct Professors serve as a vital reinforcement to the tenured staff. Ugelstad Laboratory is very fortunate to have 3 adjunct professors, i-e Dr. Martin Foss, Hans Oschmann and Roar Skartlien. Roar has specialized in Lattice-Boltzmann simulations of emulsions and brings an exciting complement to the laboratory. Roar works at IFE and is active in the FACE programme. In addition to the stuff presented above UL has also access to Prof. (emeritus) Per Steinius, who serves as an experienced consultant for us.

The laboratory facilities remained the same as in the previous years. Our modern and updated facilities are in K5 and in the PFI building at Gløshaugen Campus. All-in-all we estimate our lab space to be ~750 m^2.

Our aim is to systematically reduce the risk for people and environment and therefore HSE is our top priority. Over the past years we have made good progress by focusing on HSE, and this continued in 2012. We have established HSE training programs and performed risk assessments for all projects in the laboratory.

The major part of the research activity in 2012 was organised in large consortia with industrial members.

The research activities within the Centre for Innovation / based Research (SFi) the FACE Centre continued with activities at UL, IFE and Sintef. The main idea is to couple colloid chemistry and fluid dynamics within areas like Multiphase Transport / Suspensions / Emulsions and Separation. Ugelstad Laboratory has claimed special responsibility for the design of reference fluids mimicking true crude oils with regard to flow and separation performance. UL (Johan Sjöblom) is also PI for FACE Academy which is the forum for Lattice Boltzmann Modelling on surfactant systems and emulsions. Here there is established a near contact between UL and IFE.

The research activities in JIP 1:2 "Increased Energy Savings in Water / Oil Separation Through Advanced Fundamental Emulsion Paradigms" were started up with financial support from NFR and an international industrial pool consisting of Akzo Nobel Surface Chemistry, Champion Technologies, BP, ENI, Aker Solution, Wärtsilä, Kemira, Saudi Aramco, Shell, Statoil and TOTAL. The research work will be a collaboration between UL, University of Alberta, IFE and University of Bergen and Anvendt Teknologi AS.

Effectively the JIP 2:4 "Prediction of Ca-Naphtenate Deposition in water oil systems" was started up in June 2011 in Trondheim at Statoil R D Center. This programme is supported by industry (Clariant, Champion Technologies, Conoco Phillips, REP, Statoil, Shell, Petrobras, ENI. The central approach is to understand central mechanisms behind the formation of CaNA depositions. One of the unique approaches will be a detection of CaNA deposition on a nanogram level.
The JIP 1:2 and 2:4 were reported to the respective consortia twice during 2012. The spring meeting was organized in May in Berlin (joint event UL and Champion Technologies).
The fall meeting was in November in Barcelona.

Research activities in JIP 3: "Shut-in and Restart of Waxy Crude Pipelines: Software Module Development", Dr. Kristofer Paso, were started up in 2010.
Successful shut-in and restart of transport pipelines is a central element of flow assurance and risk abatement strategies for the production of complex petroleum fluids containing paraffin wax. A commercial software module will be developed for hydrodynamic simulation of shut-in and restart processes in petroleum transportation pipelines. The software product will serve the needs of the petroleum industry as a design tool for sub-sea production facilities. The new modelling capability will be especially useful for complex production fluids containing paraffin waxes concurrent with emulsified water, gas hydrates, or gas lift components. Accurate hydrodynamic modelling of critical pipeline shut-in and restart processes will allow petroleum producers to operate confidently within the wax and hydrate formation regimes, without the risk of permanent blockage formation during emergency outages. Ultimately, the new process simulation technology will allow production companies to more economically develop petroleum reserves in challenging environments such as deepwater and arctic locales, and provide a chemical-free alternative method, utilizing pressure

front propagation phenomena, for restart of pipelines under moderate gel formation conditions. An additional aspect of the program includes the development of a new generation of environmentally friendly pour point depressant additives. The partners in the collaboration are Ugelstad Laboratory and the Institute for Energy Technology (IFE) in Kjeller, Norway.
The sponsors are Statoil ASA, Petronas, Champion Technologies Inc., BASF SE, and The Research Council of Norway.

The importance of colloid and interfacial chemistry within treatment of offshore produced water is focused on in the JIP "Produced Water Management – fundamental understanding of the fluids", Prof. Gisle Øye, (2011-2014). The primary objective in this project is to gain fundamental understanding of the mechanisms governing removal of dispersed oil and solids, particularly targeting the hydrocyclone and flotation processes. The overall approach is to attempt to link molecular properties given by the oil and water compositions, via time dependent interfacial behaviour, to dispersion behaviour in lab and test rig scales. The project is supported by 5 industrial sponsors: ConocoPhillips, ENI Norge, Schlumberger-MI EPCON, Statoil and Total.

"A Combined Surface-Colloid Chemical and Rock-Fluid Interaction Approach towards more Efficient Enhanced Oil Recovery Strategies", Prof. Gisle Øye, 2 PhD and 1 post.doc started working in the project during the summer 2012. The primary objective of the project is to provide essential knowledge of how surfactants can improve low salinity water flooding processes by taking all the categories of indigenous crude oil components into account. The approach will range from studies at molecular and interfacial levels to fluid-rock interaction and dynamic displacement studies. The project is a collaborative effort between Ugelstad Laboratory, Department of Petroleum Engineering (NTNU) and SINTEF Petroleum Research, and is supported by 4 industrial sponsors (Det Norske Oljeselskap, GDF Suez, Lundin and Statoil).

Within the field of nanomedicine, the project "Interfaces as 2D folding templates for polypeptides", Assoc. Prof Wilhelm Glomm, has resulted in two publications detailing how combining nanoparticles and proteins could result in emergent properties, i.e.; properties not seen for either protein or nanoparticles only. Specifically, by controllably unfolding proteins onto nanoparticle surfaces, membrane permeation and miscibility is enhanced, which offers great promise within development of drug delivery vectors. In addition to the existing collaborators at the departments of molecular biology and biomedicine at the University of Bergen, we have established a strong partnership with research groups at St. Olav University hospital.

Ugelstad Laboratory had 1 PhD defence during 2012. It was Andreas Nenningsland who successfully defended his thesis "Extraction, Quantification and Study of Interfacially Active Petroleum Components" on December 17, 2012. Andreas finalized his thesis in JIP 1:2 "Increased Energy Savings in Water / Oil Separation Through Advanced Fundamental Emulsion Paradigms". Central findings are the chemistry of interfacially active crude oil components and stability mechanism in water-in-crude oil emulsions. The thesis was also a collaboration between UL and Anvendt Teknologi A/S in the field of droplet size characterization and NMR. Opponents were Prof. Björn Lindman from Lund and Maria Miquel from Coimbra in Portugal.

The scientific output 2012 followed the traditions of being very satisfactory. In addition to the 1 PhD theses we contributed with 25 original articles in refereed journals. Johan Sjöblom continued as Editor-in-Chief for Journal Of Dispersion Science and Technology, Francis and Taylor, 12 issues and 1950 printed pages per year.

New instrumentation during 2012.
Ugelstad Laboratory has done substantial investments in order to upgrade our instrument park and to meet new requirements from industry and our JIP:s. The following instruments have been purchased:
- NMR Low Frequency, Anvendt Teknologi AS
- Sinterface PAT-1M, Sinterface
-Spinining drop Tensiometer, DataPhysics
-Aquatron system (to produce distilled water), VWR
-Degazor DGU-20A5 for HPLC, Bergman
- Refractometer Arago w, Cordouan Technologies
- Q2000 Differential Scanning Calorimeter, TA Instruments
- Q600 SDT Thermogravimetric Analyzer (Refurbished Instrument) with DSC,TA Instruments

The Ugelstad simulation lab is a common lab housing 3 high performance Linux workstations with 12-16 processors each. The workstations are used for small to medium scale molecular simulations as well as simulations of emulsion separation and gelled pipe-line restart. The simulation lab was also established in 2012.

More and more people engaged in oil industry see the importance of fundamental colloid chemistry and its applications!

We are proud to be their collaborative partner!

Johan Sjöblom

Professor / Head of Laboratory

1.1 From the part-time employees

Adjunct Professor Hans Oschmann

2012 has been an excellent year for our continuation of flow assurance related research. Again we have shown that the Ugelstad laboratory can effectively contribute to do the development of new technologies by providing a fundamental understanding of the mechanisms of paraffin precipitation and gel formation, mechanisms of pipeline restart. Our JIP "Shut-in and Restart of Waxy Crude Pipelines: Software Module Development" has made good progress and we were able to correlate the modeling results obtained to real test data provided by our flow loop at IfE. In addition we have now published further work on the experimental assessment of concurrent hydrate and paraffin gel formation for the evaluation of flow assurance risks in multiphase transport lines. This work will be continued in 2013 addressing more complex topologies and compositional variations.
In our work on establishing a deeper understanding of the structure performance relationship between production chemicals such as pour point depressants and paraffin inhibitors we have completed the first experimental assessments on establishing the influence of a number of chemistries on paraffin solubility – this is new and very exciting work which will be available as publication soon.

Adjunct Professor Roar Skartlien

The research involves a combination of computer simulations and experiments performed at UL, on emulsion systems with surfactant where collective effects between emulsion droplets, and coalescence and breakup kinetics in highly dynamic flows, are important.
Both emulsions in shear flow and emulsions in turbulent flow are central, addressing common processes oil/water pipe flow that are not fully understood. Computer simulations together with experiments and accumulated knowledge give insight so that emulsion models for use in e.g. pipe flow simulators can be improved or developed.

Currently, a Lattice Boltzmann numerical simulation model that is developed at IFE (Institute for Energy Technology), can handle surfactants with a relatively simple molecular structure. Other methods are explored so that more complex molecular structure can be handled (such as the Dissipative Particle Dynamics method - DPD), but at the expense of a more local and "non-hydrodynamic" description.

A paper on coalescence kinetics in emulsions ("Coalescence kinetics in surfactant stabilized emulsions: Evolution equations from direct numerical simulations") was published in the Journal of Chemical Physics with collaborators from UL (Brian Grimes and Johan Sjöblom) and IFE (R. Skartlien, P. Meakin and E. Sollum). As a bonus, we appeared on the front page of the Journal in the December 7. issue, with a volume visualization of the surfactant distribution in an emulsion.
Currently, our work is focused on emulsions in turbulence, phase inversion phenomena that are flow-induced, and rheology in shear flow.

Adjunct Professor Martin Smedstad Foss

Funding from the Multiphase Flow Assurance Innovation Centre (FACE - Centre for Research-Based Innovation)

Martin Foss has been working with the Ugelstad laboratory since 2010 and will continue until 1 January 2015 with the current funding. His work is related the multiphase flow assurance innovation Centre (FACE) where he contributed to the improved cooperation between the Ugelstad laboratory and the Institute for Energy Technology (IFE). Martin Foss also takes over as centre manager for FACE in 2013. His main contribution is to ensure that the cooperation between IFE and the scientific personnel at the Ugelstad laboratory runs smoothly. He also ensures that knowledge obtained through the development of chemicals in the FACE project is transferred between the scientists involved in the project.
In particular his work has involved cooperation with Serkan Kelesoglu and Galina Rodionova. A common publication was written and published at the 2011 Oil Field Chemistry Symposium at Geilo.
In addition to project work he published a paper at the conference Oilfield Chemistry Symposium at Geilo 2013. He was also a co-author on a paper presented at NACE2012 in cooperation with the Japanese oil company Inpex. In addition to these activities he planned and prepared a 5 hours course on oilfield chemistry to be held at the 2012 Oil Field Chemistry Symposium at Geilo. The course includes topics dealing with the chemistry of components which creates problems in oil and gas production. The main topics for the course are: Wax, Asphaltenes, Hydrates and Inorganic Scale. Personnel from oil and gas chemicals vendors and oil companies typically attend the course.

Dr. Geir Sørland, AnTek

UL has cooperated with AT in characterizing emulsions by Nuclear Magnetic Resonance. In this work several applications for achieving physicals quantities, as brine profiles, droplet sizes and viscosities, have been developed. As one is often interested in following separation processes, e.g. adding demulsifier to an emulsion, it has been focused on developing applications that can be run on unstable emulsion. This has not been the state of the art within NMR and emulsions characterization, and thus we are in the frontier of method development for these purposes.

2.0 Some Important Events in 2012

JIP Meetings: Berlin 22-24.05.2012 and Barcelona 27-29.11.2012

10 year Anniversary, September 13th, 2012 at Louisenlyst gård Trondheim

Seminar at UL12.06.2012: Tor Austad: *"Smart Water" Flooding in Sandstones: A New Chemical Understanding of the EOR-potential"*

Andreas L. Nenningsland successfully defended his Ph.D. thesis *"Extraction, quantification and study of Interfacially active petroleum components"* on 17 December 2012

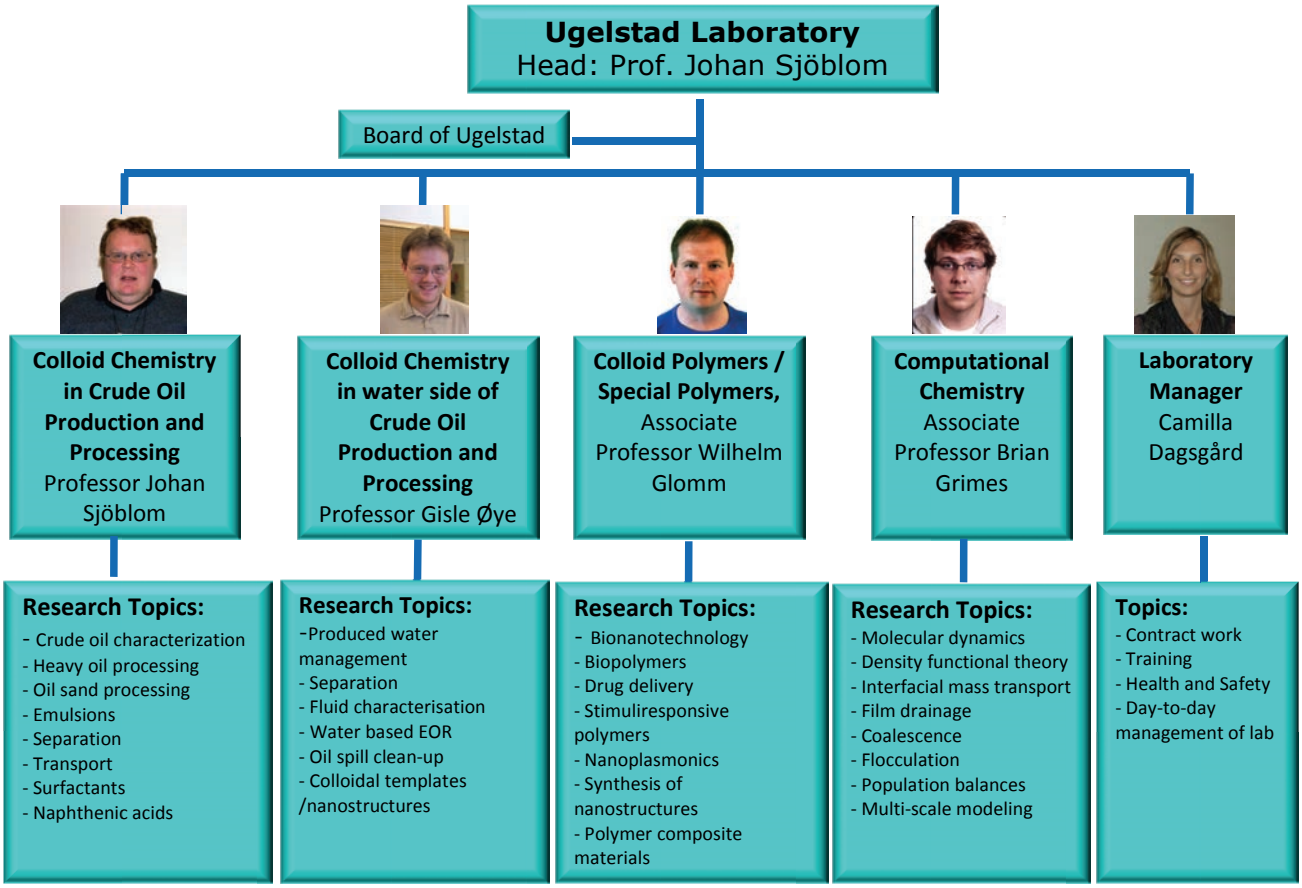
PhD students Thomas Tichelkamp and Birgitte Hjelmeland McDonagh presented on several occasions in 2012 the experiment *"make your own gold"* to school classes from all over the country. Here the kids could on their own reduce auric acid to gold nanoparticles by use of Vitamin C to see an unexpected color change. The physical background of this observation and the use of gold particles both in ancient times and in the latest research at NTNU were explained by the students.

Researcher Night 2012: PhD Sina Maria Lystvet and Thomas Tichelkamp presented a stand about gold nanoparticles

The Journal of Chemical Physics chose the image from Roar Skartlien manuscript entitled "Coalescence kinetics in surfactant stabilized emulsions: evolution equations from direct numerical simulations" **as the journal cover** featured in Volume 137 Issue 21 on 7 December 2012.

From the front left:
First row: Bartlomiej Gawel, Kristofer Paso, Galina Rodionova, Sina Lystvet, Lalit Kumar, Thomas Tichelkamp, Sulalit Bandyopadhyay, Karina Kovalchuk, Birgitte McDonagh, Bicheng Gao, Camilla I. Dagsgård, Gisle Øye
Second row: Magne K. Knag, Iva Kralova, Gurvinder Singh, Tom Helmersen, Dorota Dudasova, Torstein Haaland Yansong Zhou, Anne Silseth, Ann-Mari Hanneseth, Johan Sjöblom, Hans Oschmann, Shukun Chen, Mehdi Benmekhbi, Andreas Nenningsland, Albert Barrabino, Runar Sandnes, Philip Reme
Third row: Per Steinius, Trond Eric Havre, Serkan Kelesoglu, Marin Foss, Erland Nordgård, Sèbastien Simon, Wilhelm Glomm

3.0 Description and Organization of the Laboratory



Collaborations with Research Institutes:

- Colloid chemistry and corrosion
  Scientific collaboration with IFE, Kjeller
  1 Associate Professor II (Foss)

- Colloid chemistry in pulp and paper processing
  Scientific collaboration with PFI, Trondheim
  1 Professor emeritus (Stenius)
  2 PhDs

- FACE (CRI) collaboration with SINTEF and IFE
  3 PhDs
  1 Post Doc

Personnel:

- Professor Johan Sjöblom, Head
- Professor Gisle Øye, Materials/Produced Water
- Associate Professor Wilhelm R. Glomm, Biopolymers/Materials Researcher
- Associate Professor Brian Grimes, Modeling
- Adjunct Professor Hans Jürg Oschmann
- Adjunct Professor Martin Foss, Corrosion Inhibitors
- Professor emeritus Per Stenius, Pulp and Paper
- Researcher Bartlomiej Gawel, Colloid Chemistry
- Researcher Sebastien Simon, Crude Oils
- Researcher Kristofer Paso, Wax/Crude Oils
- Guest researcher Roar Skartlien
- Guest researcher Enrico Riccardi, Modeling
- Guest researcher Jens Norrman
- Post Doc Gurvinder Singh
- Post Doc Jamilia Safieva
- Post Doc Serkan Kelesoglu, Crude Oils

- Post Doc Galina Rodionova, Crude Oils
- Post Doc Meysam Nourani
- Laboratory Manager Camilla Dagsgård
- Laboratory Technician Caterina Lesaint
- Laboratory Technician Signe Håkonsen
- Laboratory Technician Bicheng Gao
- Laboratory Technician Murside Kes Kelesoglu
- Laboratory Technician May Grete Sætran

PhD Students:

- PhD Candidate Andreas L. Nenningsland, Crude Oils
- PhD Candidate Mehdi Benmekhbi, Colloid Chemistry
- PhD Candidate Sina Maria Lystvet , Colloid Polymers
- PhD Candidate Mona Eftekhardadkhah, Crude Oils
- PhD Candidate Divina Kaombe, Biopolymers/ Materials
- PhD Candidate Karina Kovalchuk, Crude Oils/ Modeling
- PhD Candidate Lalit Kumar, Crude oils
- PhD Candidate Albert Barrabino Ponce, Crude oils
- PhD Candidate Yansong Zhao, Crude oils
- PhD Candidate Thomas Tichelkamp, Crude oils
- PhD Candidate Sulalit Bandyopadhyay , Colloid polymers
- PhD Candidate Birgitte McDonagh, Colloid polymers

3.1 Scope of the Ugelstad Laboratory

The Ugelstad Laboratory was founded in honor of Professor John Ugelstad at the Norwegian University of Science and Technology in January 2002 (Department of Chemical Engineering). The purpose was to establish a modern educational, research and development laboratory within the field of colloid, polymer and surface chemistry.

Diploma and Ph.D. studies are offered within these topics, often in close collaboration with industrial companies. The aim is to educate highly qualified candidates for industrial positions. In order to attract the best and most motivated students and researchers, the laboratory has invested in new and modern instrumentation. The laboratory also participates in international exchange programs, and hosts internationally renowned guest researchers and lecturers.

The Ugelstad Laboratory is sponsored by industrial companies, the Research Council of Norway (NFR), research institutes and NTNU. All the members are annually invited to a presentation of the recent research activities at the laboratory. This is combined with the Ugelstad Lecture, where invited scientists lecture within the field of colloid, polymer and surface chemistry.

The laboratory specializes in surfactant chemistry and its technical applications, emulsions and emulsion technology, preparation of polymers and polymer particles and their technical applications, plasma chemical modification of surfaces and silica-based chemistry.

Applications include crude oil production and processing, pulp and paper, biomedicine, catalysis and material science.

The main purpose is to raise the national level of colloidal science.

In summary the Ugelstad Laboratory will Achieve the Following Goals:

- New and unique experimental and teaching facilities for students and researchers
- Promoting highly competitive students / Ph.D.'s in the field of colloid and polymer chemistry combined with chemical engineering
- Close collaboration with domestic and international industries
- Exchange programs with leading universities in USA (North Carolina State University and Tulsa University / (Chemical Engineering), Scandinavia and Europe
- The invitation of distinguished visiting professors for longer periods of time
- The annual John Ugelstad lecture in polymer colloids

3.2 Specification of Members

Members

Industrial companies and research institutes contribute to the research activities at the Ugelstad Laboratory. Members are classified as Founding Members or Affiliated Members. All founding members are represented in the board of the laboratory.

Founding Members

Founding members contribute 100 000 Norwegian Kroner (approximately $ 17 200) per year for a period of 3 years. The membership is renegotiated after this period. Founding members have preference to use experimental laboratory facilities and have access to research associates, Ph.D. students and diploma students at the laboratory.

- Akzo Nobel Surface Chemistry AB
- Champion Technologies Europe BV
- Wärtsilä Oil and Gas Systems AS
- Institute for Energy Technology (IFE)
- Norwegian Pulp and Paper Research Institute (PFI)
- Statoil AS
- Shell
- Total

Affiliated Members

Affiliated members contribute 50 000 Norwegian Kroner (approximately $ 8 600) per year for a period of 3 years. The membership is renegotiated after this period. Affiliated members are involved in diploma student projects without any additional costs.

- Aker Solutions

Board

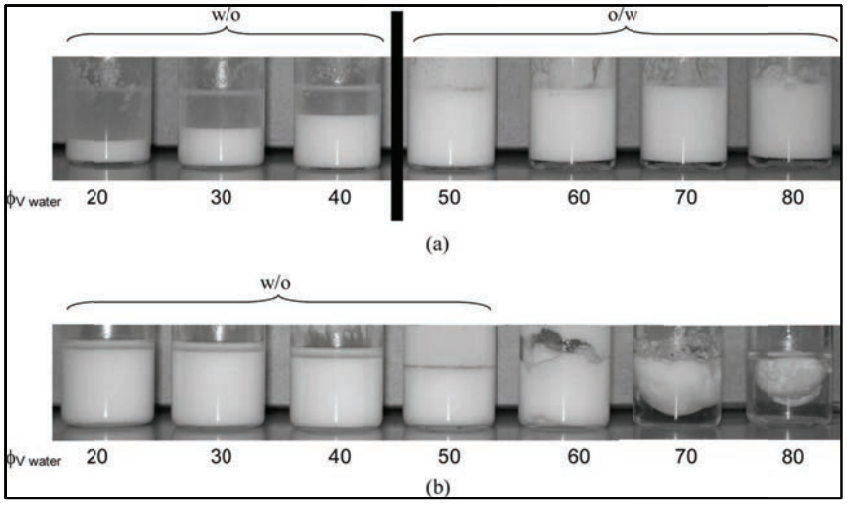
- Nicolas Passade-Boupat, TOTAL (chairman)
- Hans Oschmann, Champion Technologies (vice-chairman)
- Johan Sjöblom, NTNU (head of laboratory)
- Jens Emil Vindstad, Statoil
- Erik Bjørklund, Hamworthy Technology & Products AS
- Arve Erga, TOTAL
- Tore Gimse, IFE
- Philip Reme, PFI
- Magnus Franck, Akzo Nobel Surface Chemistry AB
- Richard Arntzen, Shell Technology Norway AS
- Gisle Øye, NTNU

4.0 Research Programmes

4.1 Crude Oil Related Research

4.1.1 JIP1: Increased Energy Savings in Water-Oil Separation Through Advanced Fundamental Emulsion Paradigms (NFR PETROMAKS) 2011 – 2014

The goal of the project is to advance fundamental knowledge of the water-oil separation process in order to make it more energy efficient and energy saving. The focus will be on accelerating the processing of high volumes of water and viscous oil by speeding-up the sub-processes of creaming and sedimentation of existing emulsions in the first stage. The second stage involves the treatment of concentrated w/o or o/w emulsions. This program is a continuation of two previous JIP projects run in the past 6 years which were focused on an improvement of understanding of the stabilizing and destabilizing mechanisms of water-in crude oil emulsions based on heavy and particle-rich crude oils and also on the modeling (start-up, rheology and separation).



ater 1

This project is a collaborative effort between the Ugelstad laboratory, University of Alberta, University of Bergen, IFE and several international partners.

Participants:
- Akzo Nobel
- BP
- Champion Technologies
- Hamworthy
- ENI
- Kemira
- Saudi Aramco
- Statoil
- Shell Global Solutions
- Total

Principal Investigator:
- Prof. J. Sjöblom

Researchers:
- Serkan Kelesoglu
- Brian A. Grimes
- Sebastien Simon

Ph.D. Student:
- Andreas L. Nenningsland
- Karina Kovalchuk
- Albert Barrabino

4.1.2 JIP2-4: Prediction of Ca-naphthenate deposition in Water-oil systems (2011-2014)

During the past years, extensive work has focused towards naphthenate precipitation from acidic crude oil. Due to a rise in crude pH, the naphthenic acids dissociate and react with divalent cations, especially calcium. These compounds accumulate at the oil/water interface and might cause costly shutdowns. It has been discovered that the key components responsible for the formation of such deposits is a group of molecules having four carboxylic acid groups named Tetra-acids.

This program is a continuation of two previous JIP projects run in the past 6 years. Several key elements about calcium naphthenate were identified. Procedures and methods were developed as well which give the JIP members a technological lead in the naphthenate treatment. The continuation of the project, JIP2-4, was developed towards the establishment of a model predicting calcium naphthenate deposition in oil/water system based on interfacial conditions together with advanced techniques to detect calcium naphthenate formation in an

early stage (on a nanogram scale). To fulfil this goal, techniques developed in the previous JIP:2 programs will be used along with new techniques especially developed for the JIP:2-4 program. We intend to establish critical conditions for gel formation.

This project is a collaborative effort between the Ugelstad laboratory and several international partners.

Participants:
- Champion Technologies
- ConocoPhilips Inc.
- ENI
- Petrobras
- REP
- Shell Global Solutions
- Statoil
- Talisman
- Total

Principal Investigator:
- Prof. J. Sjöblom

Researchers:
- Sebastien Simon
- Brian A. Grimes

Ph.D. Student:
- Karina Kovalchuk

4.1.3 Multiphase Flow Assurance Innovation Centre (FACE) - Centre for Research-Based Innovation (CRI) application (2006-2014)

An increasing fraction of hydrocarbon reserves are difficult or impossible to produce and process today mainly due to the complexity of the fluids. Production of these reserves will require new and innovative technologies. FACE will develop the knowledge base for the new predictive tools that will be essential in order to develop the new, innovative production solutions. It is expected that new SMB's will be generated based on knowledge and technology from the centre as well as development of new or improved products in existing companies.

The research is focused on transport and separation aspects of three thematic topics, i.e. heavy crude oils, dispersed systems (emulsions), and solid particulate suspensions (hydrates, wax, sand and fines). Fluid characterization is a central tool to describe complex fluids within the three thematic topics and a necessary input to hydrodynamic modeling.
We will use existing laboratories to perform both small-scale and high-pressure, large-scale flow experiments in pipes and separators. These experiments will be accompanied by multidimensional model development and their verification.

Figure: Span 80 stabilized water droplets in xylene studied by means of a Drop Bubble Micro-Manipulator (DBMM, Sinterface, Germany). The droplets are created at the tip of stainless steel capillaries and aged in the surfactant containing oil phase before they are brought to close contact. Resistance to coalescence as showed by the image is provided by formation of a thick skin at the oil/water interface. This skin is thought to be formed by precipitation of surfactant. (M. Benmekhbi)

Participants:
- Ugelstad Laboratory
- SINTEF
- Institute for Energy Technology (IFE)
- University of Oslo

Principal Investigator:
- Prof. J. Sjöblom

Researchers:
- Sebastien Simon
- Serkan Kelesoglu
- Galina Rodionova

Ph.D. Student:
- Mehdi Benmekhbi

4.1.4 Produced Water Management – Fundamental Understanding of the Fluids (2010-2014)

Good practical expertise in PW management exits among the oil and gas producers and in the related vendor industry. However, most of the expertise has been gained through trial-and-error approaches to solve field specific problems. There is a clear lack of fundamental understanding on the microscopic and molecular level with respect to the mechanisms that govern separation efficiency of dispersed components and the injectivity of the PW fluids.

The overall objective in this project is to provide a tool for industrial companies involved in PW management in terms of fundamental knowledge of interaction properties between dispersed components (oil/solids/gas) present in PW streams.

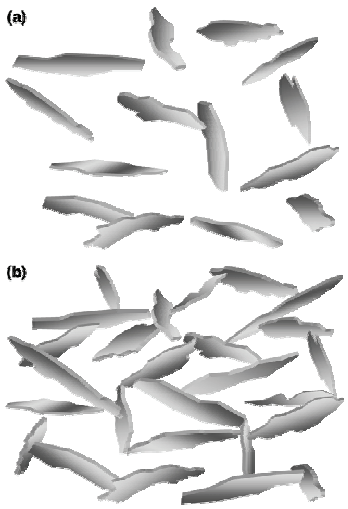
Participants:
- Ugelstad Laboratory
- ConocoPhillips Inc.
- Statoil
- Total
- ENI
- Schlumberger Norge AS Division M-I EPCON

Principal Investigator:
- Prof. Gisle Øye

Personnel:
- Mona Eftekhardadkhan
- Dr. Bartlomiej Gawel

4.1.5 Shut-in and Restart of Waxy Crude Pipelines: Software Module Development (2010-2013)

Waxy oil is commonly found on the Norwegian Continental Shelf and elsewhere. Production through sub-sea pipelines must at times be stopped, and these fluids will then tend to form a gel-like structure. It is thus essential to design and operate the pipeline such that restart is possible. It has been observed that when the inlet pressure is increased it can take days for the gel to start moving. No model can accurately predict this process, and it is recognized in the industry that this is a gap in their design tools. In order to address this, a major project is jointly initiated by the Ugelstad Laboratory at NTNU and IFE at Kjeller. They are internationally leading centers on properties of complex fluids and on multiphase pipeline transport, respectively. Detailed rheological measurements will be done on gelled oil properties and on the removal of gelled oil from a pipeline. A model will be developed to encapsulate a physical understanding of the gel-breakage process into a simulation tool. It will account for chemicals injected to reduce wax formation, and thus enable optimal use of these. This model will finally be condensed to a useful tool for engineers designing production pipelines. It will fit with the industry standard simulation tool for transport of gas, oil and water in pipelines. The primary objective is to develop a software module which enables hydrodynamic predictions of shut-in and restart processes in multiphase petroleum pipelines with waxy oil. An additional focus of the project will be to develop new chemical additives, including pour point depressants, yield point depressants, and wax dispersants, for use in gelled pipeline restart applications.



Participants:
- Ugelstad Laboratory
- Institute for Energy Technology (IFE)
- Champion Technologies
- Statoil
- BASF
- Petronas

Principal Investigator:
- Dr. Kristofer Paso

Researcher:
- Dr. Brian A. Grimes

PhD students:
- Yansong Zhou
- Lalit Kumar

4.1.6 A Combined Surface-Colloid Chemical and Rock-Fluid Interaction Approach towards more Efficient Enhanced Oil Recovery Strategies (NFR PETROMAKS, 2012 – 2015)

The objective of the project is to provide essential knowledge of how surfactants can improve low salinity water flooding processes by also considering indigenous crude oil components. The studies range from molecular level to fluid-rock interaction and dynamic displacement studies.

The project is a collaborative effort between Ugelstad Laboraory, Department of Petroleum Engineering and SINTEF Petroleum Research.

Industrial participants:
- Det Norske Oljeselskap
- GDF Suez
- Lundin Norge
- Statoil
- Unger Surfactants

Prinicipal Investigators:
- Prof. Gisle Øye

Personnel:
- Thomas Tichelkamp
- Dr. Meysam Nourani

4.2 Materials/Nanotechnology Related Projects

4.2.1 Interfaces as 2D Folding Templates for Polypeptides 2009-2013

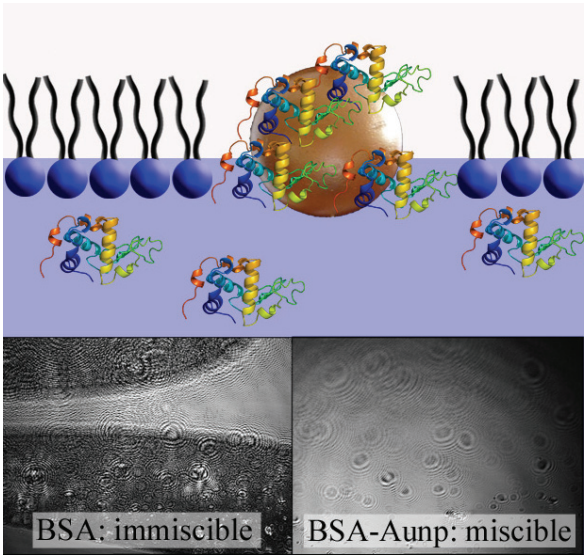
Interaction of dissolved proteins with nanomaterials and interfaces is essential for a wide range of applications, ranging from reduction of biofouling via biosensing and enzymatic catalysis to targeted intracellular drug delivery. An understanding of the underlying mechanisms and adsorption kinetics is therefore crucial to the design of new smart materials which can be used to control protein deposition and delivery. Protein-surface and protein-protein interactions are determined by chemical and physical factors such as electrostatic forces, curvature, hydrophobic interactions and steric constraints. This in turn leaves an abundance of possibilities for manipulation of these surfaces, enabling interaction studies with biological membrane mimics and various delivery vehicles (e.g., Au nanoparticles, liposomes).

Participants:
- Ugelstad Laboratory, NTNU
- Dept. of Biomedicine, UiB
- Dept. of Chemistry, F&M College
- Dept. of Chem. Eng, Osaka Prefecture University

Principal Investigator:
- Dr. Wilhelm R. Glomm

Ph.D. student:
- Sina Maria Lystvet

Figure: Emergent membrane-affecting properties of BSA–gold nanoparticle constructs
Gold nanoparticles possess unique optical and surface properties and represent promising materials as e.g. drug delivery vectors, biomarkers and folding templates for proteins. The conformation of the protein dictates protein function and interaction with interfaces, and as such manipulation of the protein-fold might invoke emergent properties useful for improved understanding and potential treatment of protein misfolding diseases such as Alzheimer's and Parkinson's. Adsorption of bovine serum albumin (BSA) onto gold nanoparticles (Aunps) results in partial unfolding of the protein. The resulting BSA–Aunp constructs induce miscibility with phospholipid monolayer films, a trait not seen for BSA or Aunps alone, as well as disruption of liquid crystalline domains in the film. These protein-Aunp constructs might improve interaction with cell membranes and hence intracellular delivery.



4.2.2 Anisotropic Gold Nanostructure

Anisotropic noble metal nanostructures have been the focus of intense attention owing to their size-and shape-dependent physical and chemical properties. These properties have driven their numerous applications in areas such as spectroscopy, catalytic, sensor, energy, and biomedicine. In recent years, synthetic routes have been explored for metal nanostructure with high index facets which possess a high density of low-coordinated atoms serving as active sites for breaking and forming chemical bonds. Therefore, such nanostructure significantly enhance catalytic activity and stability than to flat plane nanostructure where the atoms are closed-packed i.e., atoms are saturated. It is, however a great challenge to synthesis such nanostructures with tunable size or geometry because of high surface energies without any size or shape separation. Our group investigate a novel seed mediated method by using binary surfactants to grow a variety of nanostructure including pyramids, tetrahexahedral, elongated tetrahexaderal, nanoprism, and multifaceted nanorods. The aim of this work is to understand the role of different halide ions present in secondary surfactant which acts as structure directing agent in the formation of various shaped nanostructures along with cetylammonium bromide (CTAB) as a primary surfactant. We further measure optical properties and electrochemical catalytic activity of these nanostructures.

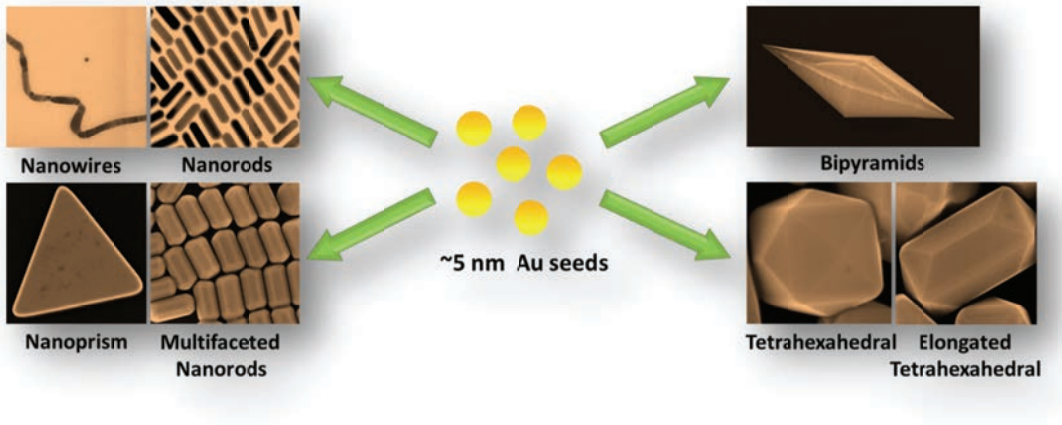


Figure: Scheme illustrating the growth of various shaped gold nanostructures via seed mediated approach in the presence of different halides and silver ions

4.2.3 In vitro toxicity of protein-gold nanoparticle constructs and gold coated iron nanoparticles (2012-2013)

Proteins, such as bovine serum albumin (blood serum transport protein) and transferrin (transports iron into cells), can reduce aqueous gold (III). As the gold ions are reduced, they grow on the protein backbone, changing the tertiary structure of the protein. The combination of protein and gold give rise to novel optical properties. Our group has shown that these constructs have high affinity towards lipid membranes. In vitro toxicity of protein-gold nanoparticles on different neural stem cells are currently being performed at the Department of Circulation and Medical Imaging. Recent results show that protein-gold nanoparticle constructs can cause a massive disruption on cell membranes at higher concentrations. At lower concentrations, the disruption of cell membranes is less prominent. However, the constructs have been shown to assemble around the cell body, were they can be visualized by standard immunostaining excitation wavelengths.
Nanoparticles that do not disrupt the cell membrane, but is taken up, can possibly be used as vehicle for targeted drug delivery. Synthesis of iron nanoparticles with an outer shell of gold (core-shell nanoparticles) can be modified with poly (ethylene glycol) (PEG) for in vitro studies (figure XX). Iron and gold both have magnetic properties that can be used as contrast agents in MRI.

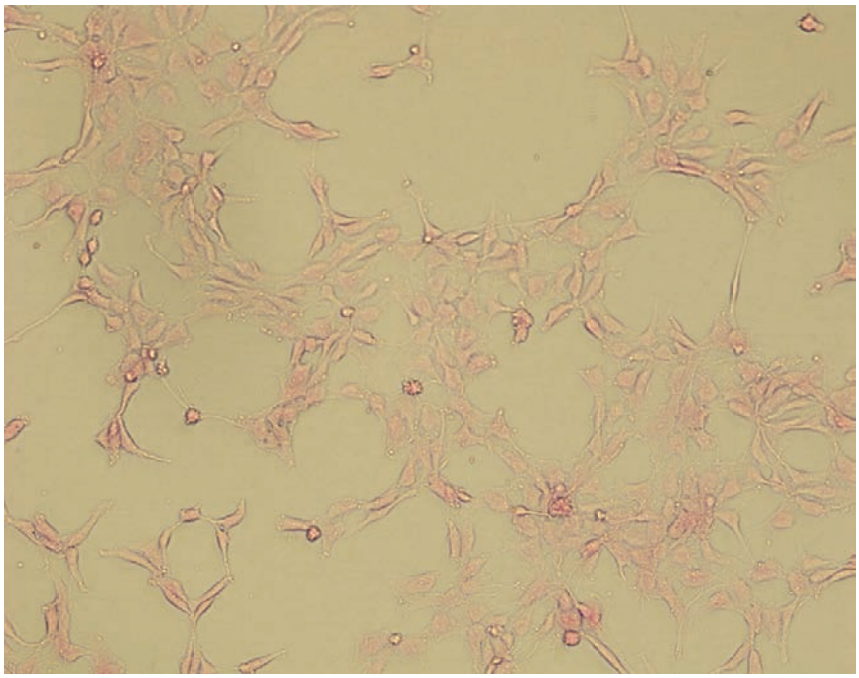


Figure: Gold coated iron nanoparticles modified with PEG were added to olfactory ensheating cells (neuronal cells) and colored with Prussian Blue. Intracellular and extracellular dark areas indicate iron nanoparticles.

4.2.4 Smart and Multifunctional Core-shell Nano-particles (NPs) for Drug Delivery.

Core-shell nano-particles (NPs) represent a new class of materials, possessing tunable multifunctional properties for which they find wide applications in electronics, catalysis, separations, drug delivery and medical diagnostics. The field of medical diagnostics and drug delivery is one of the most important application fields of such nano-constructs. This comes with the need to unite various functionalities like contrasting, targeting, imaging into a single nanostructured system, integrating the strengths of individual modalities in order to produce multifunctional constructs.
The project aims at synthesizing and characterizing core-shell NPs suited to targeted drug delivery applications. The optimized NPs would therefore be screened for surface functionalization with multiresponsive block copolymers, synthesized in-house to target drugs and small molecules. Molecular dynamics studies will be carried out to simulate release kinetics in vitro and then validated against experimental results. These nano-constructs will be tested in regards to magnetic resonance imaging (MRI) contrast agent, targeted drug delivery and other pertinent applications. These nanomaterials will have multifunctional applications in diagnostic and therapeutic fields.

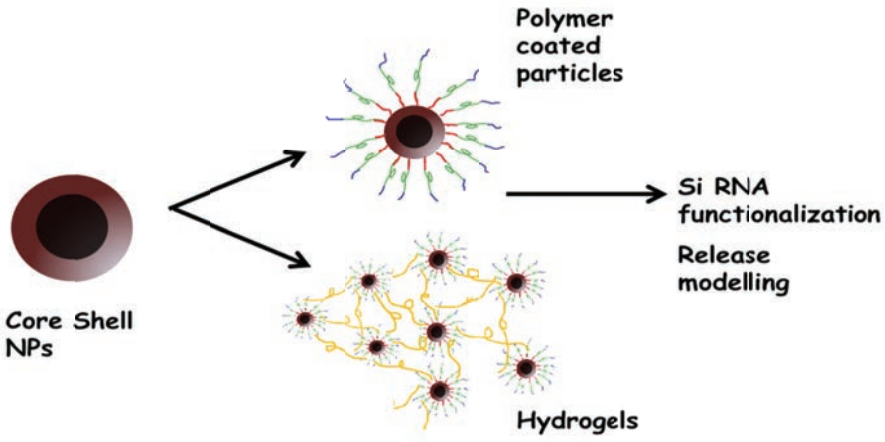


Figure: Overall Schematic of the project

4.3 Completed Projects

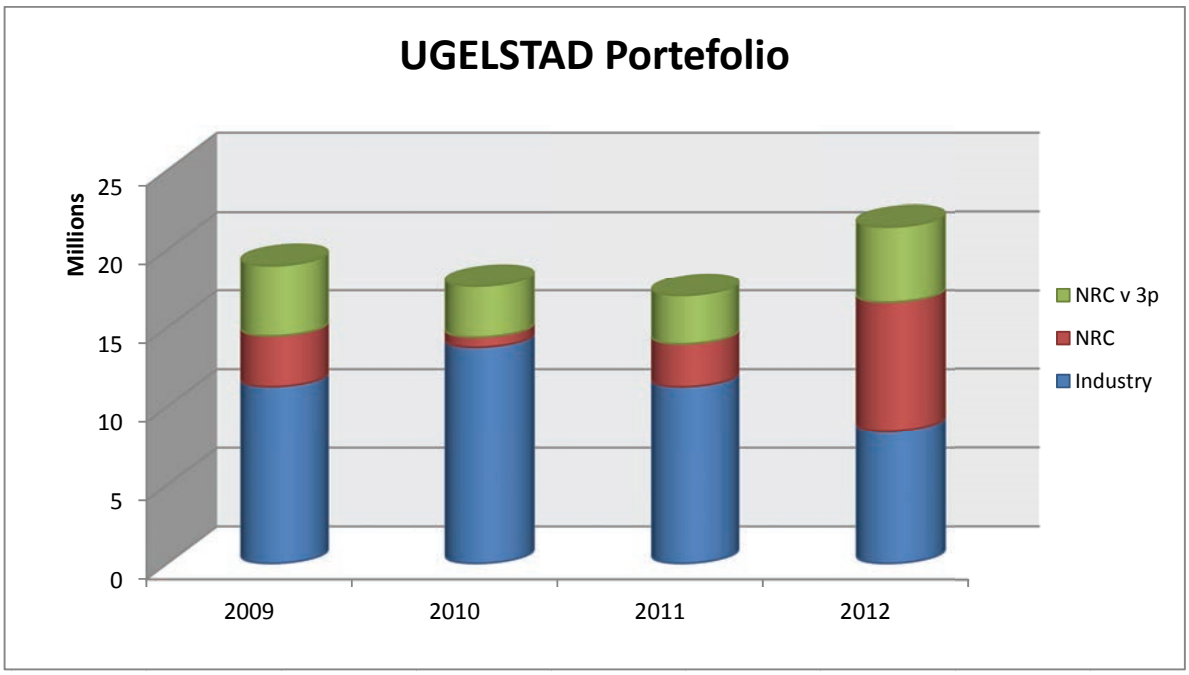
- Thermoresponsive Polymer Brushes on Nanoparticles and Surfaces (NFR FRINAT) 2007-2010
- EEA – Development of Nanostructured microreactor-based reaction technologies (Polish-Norwegian research Fund) 2008-2010
- Improved Oil recovery by Low Salinity Waterflooding: Surface Chemistry and SCAL Studies (VISTA 2007 – 2010)
- Electrocoalescence II - Criteria for an efficient process in real crude oil systems (KMB - NFR), 2006 – 2010
- New JIP 1/Flucha IV: Waxy Crude Oils and Emulsions: Start-up and Separation (2008 – 2010)
- JIP2-3: A Mechanistic Approach to Naphthenate Precipitation (2008 – 2010)
- Treatment of Produced Water: Characterization and New Treatment Strategies. (Top Water), 2004 – 2009
- An Integrated Approach to Interfacial/Surface Processes in Crude Oil Systems (NFR PETROMAKS), 2006 – 2009
- JIP2 continuation: Chemistry and Physico-Chemical Behavior of ARN Naphthenic Acids and Corresponding Metal Naphthenates (2007 – 2009)
- Structure, behavior and reactivity of tetrameric naphthenic acids (ARN) in bulk and at w/o interfaces (2005 – 2008)
- Surface and Interfacial Properties of Lignosulfonates and Derivatives (2006 – 2008)
- Synthesis and characterization of ordered mesoporous Al-materials for Fischer-Tropsch catalysis (2006 – 2008)
- Development of new bio based materials using nanotechnology
- Particle-stabilized emulsions/Heavy crude oils (2003 – 2007)
- Effects of Crude Oil on the CO_2 Corrosion of Carbon Steel.
- Dendritic nanoporous materials with multifunctionality (2004 – 2006)
- Plugging and Non-plugging Crude Oil Systems, Gas Hydrat Slurries (2003 – 2006)
- Strategic Reorganization Plan (SRP), 2003 – 2006
- Scientific Design and Preparation of New Catalysts and Supports (2002 – 2006)
- Parasitic Consumption of Corrosion Inhibitors (2002 – 2005)
- Interfacial Reactions between Naphtenic Acids and Multivalent Cations (2003 –2004)
- Fundamental Physico-chemical Characterization of Indigenous Naphthenic Acids Corresponding Model Compounds in Systems with Oil and Water (2002 – 2005)
- Fluid Characterization at Elevated Temperatures and Pressures (FLUCHA II), 1999 – 2002
- Scientific Design and Preparation of New Catalysts and Supports (2002 – 2006)
- Dendritic nanoporous materials with multifunctionality
- Interfacial Reactions Between Naphthenic Acids and Multivalent Cations (2003 – 2005)
- Parasitic Consumption of Corrosion Inhibitors (Administrated by IFE), 2002 – 2005
- Fluid Characterization at Elevated Temperatures and Pressures (FLUCHA II), 1999 – 2002

5.0 Contract Work

The Ugelstad laboratory has done contract work for the following companies:

- ABB
- Aker Solutions
- Akzo Nobel
- Baker Petrolite
- Borregaard LignoTech
- BP
- Champion Technologies
- Clariant
- DeepStar
- DNO
- DuPont Norge AS
- Elkem Carbon AS
- Emerson Process Management
- FMC Technologies
- Grenland Group
- Hamworthy/ Wärtsilä Oil & Gas Systems AS
- Institute for Energy Technology (IFE)
- Paper and Fibre Research Institute (PFI)
- Intertek WestLab
- Kemira Oyj
- Maersk Oil & Gas AS
- National Oilwell Varco
- Norske Skog
- NTNU
- Petrobras
- Petrodrar
- Petronas• Premier Oil
- REC ScanWafer
- RG Mineral AS
- Roxar
- Saudi Aramco
- SINTEF Energy Research
- SINTEF Materials Technology
- SINTEF Polymer Division
- Statoil
- Talisman Energy Inc.

6.0 Research Portfolio



Ugelstad Laboratory is mainly financed by three sources: Projects with direct financial support from The Research Council of Norway (NRC), Projects from NRC where we are partners (NRC v3p) and projects with direct support from Norwegian and International industry. The chart above describes the development of the portfolio the recent years.

7.0 Personnel

From left
First row: Sina Marie Lystvet, Birgitte Hjelmeland McDonagh, Mona Eftekhardadkhah Galina Rodionova,
Second row: Mehdi Benmekhbi, Bartlomiej Gawel, Jens Norrman, May Grete Sætran
Third row: Wilhelm Glomm, Bicheng Gao, Thomas Tichelkamp, Serkan Keleşoğlu
Fourth row: Sébastien Simon, Albert Barrabino, Shreedhar Subramanian, Meysam Nourani
Fifth row: Omar Olhaye, Gisle Øye, Johan Sjöblom

7.1 Senior Personnel

Professor Johan Sjöblom
Johan Sjöblom has been Professor in surface and colloid chemistry and the Head of the Ugelstad Laboratory at the Norwegian University of Science and Technology (NTNU) in Trondheim from January 1st 2002. He was earlier Professor at the University of Bergen during the years from 1988-1999, and Chief Researcher at Statoil's R&D Centre in the period 1998-2001. Sjöblom has served as Adjunct Professor of Colloid Chemistry and Materials Science at Clarkson University, Potsdam, New York, and at the Technical University of Helsinki from 1992-1999.

Sjöblom is the editor of 10 books, and the author or coauthor of more than 300 professional papers. He has educated 50 PhD's and 35 MSc's.

Sjöblom is Editor-In-Chief (from 2005) for Journal of Dispersion Science and Technology, and previous Editorial Board Member of Colloids and Surfaces during the period 1993-2003. Sjöblom is also a member of the Advisory Board of Microporous and Mesoporous Materials. He is a member of the American Chemical Society, the Norwegian Chemical Society, and the Finnish Chemical Society. He is also elected Member of the Norwegian Academy of Technological Sciences and the Swedish Academy of Engineering Sciences in Finland. Sjöblom received his PhD degree (1982) in physical chemistry from the Åbo Akademi, Finland.

Sjöblom has been an industrial consultant in colloid chemistry since 1980

Professor Gisle Øye
Gisle Øye started as a research scientist at the Ugelstad Laboratory March 1st 2002 and was appointed Professor in 2009. His research interests are focused on colloid chemistry and interfacial phenomena within Produced Water Management, Enhanced Oil Recovery and synthesis of nanostructured materials.

Dr. Øye received his doctoral degree at the University of Bergen in 1999. In the period 2000-2002 he worked with plasma chemical modification of porous polymers at the University of Durham (England).

Associate Professor Wilhelm Glomm
Wilhelm Glomm joined the Ugelstad Laboratory as a Ph.D. student May 1st 2003 to participate in the project "Scientific Design and Preparation of New Catalysts and Supports". His main focus will be on design, synthesis and characterization of catalytically active particles from colloidal templates. In addition to that, he is responsible for maintaining and updating the Ugelstad Laboratory web page.

Wilhelm Glomm has previously worked with phase behavior of surfactant-polyelectrolyte-cosurfactant systems, and he received his Cand. Scient. on this subject from the University of Bergen in 2000. From January 2001 to April 2003, he worked as a graduate student at the Department of Chemistry, North Carolina State University, under the guidance of Dr. Stefan Franzen and Dr. Daniel L. Feldheim. His main project included design, characterization and cellular delivery of "intelligent" metallic nanoparticle drug carriers for targeted intracellular/nuclear delivery.

Following his defense June 23rd 2004, Dr. Glomm joined the Ugelstad Laboratory as a post doc., before transitioning into his current position as an Associate Professor (from April 2006). His main research interests are soft condensed matter on surfaces, plasmonics, targeted drug delivery/diagnostics, photonics and molecular spectroscopy.

Associate Professor Brian A. Grimes
Brian Grimes has a background in mathematical modeling of electrochemical transport phenomena and transport phenomena in porous media. He obtained his Ph.D. in 2002 from the University of Missouri-Rolla under the supervision of Professor A.I. Liapis. Upon completion of his Ph.D., he obtained an Alexander von Humboldt Research Fellowship and began his post-doc in Mainz, Germany under the supervision of Professor K.K. Unger. In 2007, he joined the Ugelstad laboratory. His current research involves constructing a multi-scale modeling framework for transport processes in colloidal dispersions which incorporated molecular and Stokesian dynamics simulations along with population balance modeling.

Adjunct Professor Hans Oschmann
Hans Oschmann is working at Champion Technologies as – He came from the German Petroleum Institute in 1998 where his research focused on flow assurance related issues; specifically multiphase transport phenomena caused by the concurrent formation of gas hydrates and paraffin.

Associate Professor II Martin Foss
Martin Foss has been working with the Ugelstad laboratory since 2010 and will continue until 1 January 2013 with the current funding. His work is related the multiphase flow assurance innovation Centre (FACE) where he contributed to the improved cooperation between the Ugelstad laboratory and the Institute for Energy Technology (IFE).

Professor Emeritus Per Stenius
Professor (emeritus) Per Stenius was born in 1938 in Helsinki, Finland. He graduated from Åbo Akademi (University), Turku (Åbo), Finland. He received his Ph.D. degree from the same university and worked there as a teacher and acting professor from 1966-1977. He was the director of the Institute for Surface Chemistry (YKI), Stockholm 1977-1991, and Professor of Forest Product Chemistry at Helsinki University of Technology (HUT) from 1991 to April 2003. Professor Stenius was also Associate Professor at the University of Bergen, Norway, from 1997-1999. He retired as chair at HUT in 2003, but retains research activities at HUT in addition to holding an Adjunct Professorship at the Ugelstad Laboratory, Norwegian University of Science and Technology (NTNU) in Trondheim from September 2003.

Professor Stenius is a member of the Finnish and Swedish Academies of Engineering Science as well as the Swedish Academy of Science. He has been a member of the board of several international associations in surface and colloid chemistry, and he has also served as President of the International Association of Colloid and Interface Science (1986-87), and of the European Colloid and Interface Society (1993-94). Professor Stenius has published about 320 scientific papers and edited several books in the field of applied surface and colloid science. His present research interests are in the field of surface and colloid science in forest products technology, in particular fiber surface properties, recycling of fibers, adhesion and surfactant/polymer interactions.

Dr. Sébastien Simon
Sébastien Simon has joined the Ugelstad Laboratory as a post doc in February 2006. He is now a researcher currently involved in 3 different research projects: JIP-1 (Study of petroleum emulsions), JIP-2 (determination of formation mechanism of calcium naphthenate deposits) and FACE (de-emulsification of crude oil emulsions).

He has previously worked with the study of solution and interfacial properties of amphiphilic polysaccharides under the guidance of Dr. Guy Muller, Pr. Didier Le Cerf and Dr. Luc Picton and received his doctoral degree on this subject at the University of Rouen (France) in 2003. After a research assistant position in the University of Rouen, he worked for 16 months in the French Petroleum Institute (IFP, Rueil Malmaison, France) on the determination of rheological, emulsifying and adsorption properties of the higher molecular mass components of crude oils (asphaltenes) under the guidance of Research Engineer Loïc Barré.

Dr. Kristofer Paso
Kristofer Paso joined Ugelstad as a Post-Doc in July of 2006. His current research interests involve developing an integrated approach to interfacial and surface processes in crude oil systems. Example systems include emulsions, catalysts, and reservoir minerals. Laboratory techniques of atomic force microscopy (AFM) and thermal gradient quartz crystal microscopy (TG-QCM) are used in the investigations. Other interests include interfacial rheology of complex colloidal and polymer systems, as well as developing an understanding of flow start-up processes in pipelines filled with gelled fluids such as wax, emulsions, and dispersions.

Dr. Serkan Kelesoglu
Serkan Kelesoglu completed his Master of Science degree in Physical Chemistry at Izmir Institute of Technology/Turkey in July 2007. The title of his thesis was "Comparative Adsorption Studies of Heavy Metal Ions on Chitin and Chitosan Biopolymers". He also worked as a researcher in project that titled "Determination of the Particle Interactions Rheology-Surface Roughness Relationship for Dental Ceramics". All laboratory works were performed with advisory of Prof. Hürriyet Polat in Chemistry Department at Izmir Institute of Technology during 2005 - 2007.

Serkan Kelesoglu joined the Ugelstad Laboratory as a PhD student in October 2007, in the project preliminary titled "Multiphase Flow Assurance Centre" (FACE). This project is a joint venture between SINTEF, IFE, NTNU, Ugelstad Laboratory and industrial partners. His contribution to the project mainly focuses on preparation of model fluids for crude oil emulsions. He is trying to mimic interfacial, rheological, stability, emulsion etc. properties of crude oils using synthetic oils, polymers, surfactants and colloidal particles.

Dr. Bartlomiej Gawel
Bartlomiej Gawel started as a research scientist at the Ugelstad Laboratory in March 1st 2009. He is currently working on interfacial characterization of crude oils/produced water systems and studying influence of inorganic particles on the interfacial properties in the frame of the research project: Produced Water Management – fundamental understanding of the fluids.

Dr. Gawel has previously worked at Ugelstad laboratory with preparation and characterization of inorganic porous monolithic catalysts for liquid phase glucose oxidation in the frame of the TE-RENE-RES project financed by Polish-Norwegian Research Funds. He received his doctoral degree on structural characterization of the crystalline materials form X-ray powder diffraction at the Jagiellonian University in Krakow, Poland, in September 2008.

Dr. Gurvinder Singh
Gurvinder Singh has a background in materials science and received Ph.D. from iNANO Center, University of Aarhus, Denmark in 2010. Before joining Ugelstad lab in October 2011, he has worked as Postdoctoral Research Fellow with Dr. Rafal Klajn at Weizmann Institute of Science, Israel. The main areas of his research are chemical synthesis of metal and metal oxide colloidal nanoparticles, self-assembly of nanoparticles into complex structures and understanding the driving forces behind them, protein patterning by colloidal lithography and use of functionalized nanoparticles for biomedical applications

Dr. Jamilia Safieva
Jamilia Safieva completed her Master of Science degree in the field of Biochemistry at Lomonosov Moscow State University, Russia, in June 2004. The title of the thesis is "Investigation of Bacillus endospores enzymatic destruction by Atomic Force Microscopy ". She obtained her PhD in Physical Chemistry and Chemical Technology of Fuels and High-Energy Substances under the supervision of Professor Rustem Syunyaev and Professor Sergey Varfolomeev at the Institute of Biochemical Physics, Russian Academy of Sciences, Moscow, Russia, in April 2011. Thesis title is "Asphaltene adsorption on solid surfaces and their aggregation in petroleum dispersed systems". The PhD study has been carried out within collaboration with Gubkin State Oil&Gas University, Moscow, Russia.
During PhD studies she had an internship at Rice University, Houston, Texas, USA, where she worked on modeling of asphaltene phase behavior. Within the collaboration with Gubkin University she worked on application of chemo metric methods for qualitative composition analysis of petrochemical products.
Jamilia Safieva joined the Ugelstad Laboratory as a post-doctoral fellow in August 2011.
Her research is associated with a joint industrial project co-funded by the Research Council of Norway and industry which is titled: "Shut-in and Restart of Gelled Oil Pipelines: Software Module Development".
Dr. Savieva resigned from Ugelstad laboratory in July 2012.

Dr. Galina Rodionova
Galina Rodionova completed her master's degree in the field of Biotechnology (Wide Profile Chemistry) from the Arkhangelsk State Technical University, Russia in June 2008. She obtained her PhD in Chemical Process Technology (NTNU, 2011) under the supervision of Professor Øyvind Gregersen. The PhD study has been carried out within the scope of the joint project "Fiber based packaging materials: Development of innovative and sustainable barrier concepts (SustainBarrier)" initiated by the PFI, SINTEF and NTNU.
Galina joined the Ugelstad laboratory as a post-doctoral fellow in February 2012. Her research focuses on preparation and characterization of the synthetic reference fluids for crude oils and their emulsions.

Dr. Meysam Nourani
Meysam Nourani has a PhD in petroleum engineering from Sharif University of Technology, Iran, and studied chemical and petroleum engineering at Sharif University and Tehran University. He has been in the oil industry since 1998. Also he was the director of MAPSA's core analysis laboratory since 2010 before joining Ugelstad laboratory as a post-doctoral fellow in October 2012.
The title of his PhD thesis was "Investigation of Rheological Behavior of Polymer on EOR in Carbonate Reservoir" and right now he is involved in the project titled "A Combined Surface-Colloid Chemical and Rock-Fluid Interaction Approach towards more Efficient Enhanced Oil Recovery Strategies" which he is focused more on surfactant-surface interactions.

Dr. Roar Skartlien
Roar Skartlien holds a degree of electrical engineering from Gjørvik Ingeniørhøgskole (1991), a Master's degree in Astronomy from University of Oslo (1994) and a PhD in solar physics (with computer simulations of turbulence and waves in the solar atmosphere) from the University of Oslo (1998). After post doctorates at the University of Colorado (JILA), and at the National Center for Atmospheric Research in Colorado (HAO) on similar subjects, he moved to his present position as Senior Scientist at the Institute for Energy Technology, IFE. He has co-operated in research on emulsion physics and chemistry with the Ugelstad Laboratory (UL) at NTNU since 2007, with focus on computer simulations of hydrodynamic systems, including surfactant effects and emulsions.

Dr. Enrico Riccardi
Enrico Riccardi started as a visiting researcher at Ugelstad laboratory in November 2012. He is currently working on study and characterization by Molecular Dynamics of surfactants naturally present in the water-oil interfaces. The study should provide the parameters required by a recently developed model to predict the transport and precipitation rate of the surfactants at different ph. He has written from scratch a program able to perform MD simulations used for study and characterizations for porous media.

Enrico Riccardi completed his B.S. Degree in Textile Engineering 2005 and he got a M.S. Degree in Chemical Engineering 2006 at the, Department of Chemical Engineering at Politecnico di Torino (Technical University of Turin), Italy. .He obtained his PhD in 2009, with a Degree in Chemical Engineering at Department of Chemical and Biological Engineering, Missouri University of Science and Technology (Formerly University of Missouri-Rolla). From 2009 – October 2012 he worked as a Post Doc in a researcher group at the Theoretical Physical Chemistry department, TUD (Technical University of Darmstadt)

Dr. Jens Norrman,
Visiting Post doc from Coimbra University, Portugal. He obtained his PhD from Lund University in 2007. Jens joined Ugelstad laboratory in October 2012 and is currently working in a joint project with BASF and Coimbra University on the deposition of polyelectrolyte-surfactant complexes."

Camilla I. Dagsgård
Camilla I. Dagsgård completed her Cand. Scient degree in Biotechnology in 2001 and has years of experience from laboratory work with analytical chemistry and microbiology. When starting to work as an engineer at Ugelstad Laboratory in 2009 she came from the quality control department of GE Healthcare. Camilla I. Dagsgård is now the Laboratory Manager of the lab.

7.2 PhD Students

Ph.D. Albert Barrabino
Albert Barrabino has a background of Chemical Engineering in the University of Barcelona in 2011. He wrote his Master Thesis "Synthesis of Mesoporous Silica Particles with Control of both Pore Diameter and Particle Size" at Chalmers University of Technology, Sweden 2011. Albert joined Ugelstad Laboratory in January 2012 as a PhD Student under the supervision of Johan Sjöblom. His main area of research is the study of emulsions using the low field NMR technique.

Ph.D. Mehdi Benmekhbi
Mehdi Benmekhbi completed his M.Sc. degree in Chemical Engineering from Pierre and Marie Curie University (Paris VI), France in August 2009.
He started his Ph.D. work at the Ugelstad Laboratory in October 2009 under the supervision of Professor Johan Sjöblom. His research focuses on investigating the properties of the interfaces of surfactant stabilized emulsion droplets. This work is part of the "Multiphase Flow Assurance Centre" (FACE), a joint venture between SINTEF, IFE, NTNU, Ugelstad Laboratory and industrial partners.

Ph.D. Mona Eftekhardadkhah
Mona Eftekhardadkhah completed her master's degree in the field of wastewater treatment using the flotation process (computational fluid dynamic modeling) from Iran University of Science and Technology (IUST), Iran in August2009. She started her Ph.D. work in the Ugelstad Laboratory in June 2010 under supervision of Professor Gisle Øye. The Ph.D. work is conducting on fundamental understanding of fluids in order to use the knowledge in wastewater management filed. The

main focus of the thesis is study the colloidal interactions between gas/oil/water phases in flotation process. The project is a joint project initiated by NTNU, Statoil, Total, Conoco Philips, MI-Epcon and Eni norge.

Ph.D. Karina Kovalchuck
Karina Kovalchuk obtained her master degree in Chemical Engineering at Cape Peninsula University of Technology (Cape Town, South Africa) in 2011. Dissertation was a part of industrial project ”Emulsion Development” sponsored by African Explosives Limited Company. Karina has a background in organic, colloid and computational chemistry. She joined the group in March 2011 and started her PhD project under supervision of Professor Brian Grimes. Her PhD work is focused on molecular dynamic simulations of liquid-liquid interfaces and interfacial mass transport in emulsion systems.

Ph.D. Divina Kaombe
Divina Kaombe completed her Master’s degree in 2008 at University of Reading, England. Her master thesis was based on mineral partitioning in milk at higher temperature; microfiltration, ultrafiltration and dialysis techniques were used for investigation. Divina joined NTNU as a PhD student in 2010; the major part of her work has been undertaken at Ugelstad Laboratory under co-supervision of Associate Professor Wilhelm Glomm. Her PhD work is focused on studying stability and phase separation tendency of pyrolysis oil (bio oil). This is a joint project between NTNU and PFI."

Ph. D. Lalit Kumar
Lalit Kumar has done Bachelor and master degree in Chemical Engineering at Indian Institute of Technology Kanpur (IIT Kanpur) in 2004, on the topic ”The Liner stability analysis of single and bilayers fluid flow past a deformable solid”. Lalit has background in Fluid Mechanics, Computational methods, Non-linear analysis and colloid and interracial phenomena. Before joining the group in June 2011, He has worked on different places including IISc Bangalore and Unilever R&D Bangalore. His PhD work is focused on mathematical modeling of restart flow of irreversible thixotropic waxy crude oil.

Ph. D. Sina Maria Lystvet
Sina Maria Lystvet started her PhD work at Ugelstad Laboratory in March 2009. The work will consist of studies of some selected proteins, and their interaction with some interfaces. Included in the work will be to observe how these interactions change when the proteins are bound to gold nanoparticles. The thematic title of the thesis is "Emergent properties of protein-gold Nano constructs for biomedical applications". Her Master Thesis was about bio catalysis, and was completed in December 2008. The master work was performed at the chemistry department, NTNU.

Ph.D. Andreas Lyng Nenningsland
Andreas Lyng Nenningsland completed his master's degree at the Department of Chemical Engineering, NTNU in 2009, working on determining the content of basic components in crude oils. He joined the Ugelstad laboratory in august 2009 as a Ph.D. under the supervision of Prof. Johan Sjöblom, and is currently studying emulsion stabilization and interfacial rheology of asphaltenes and an asphaltene model compound.
He finished his work at Ugelstad Laboratory after defending his thesis in December 2012.

Ph.D. Sulalit Bandyopadhyay,
Sulalit Bandyopadhyay completed his MSc in Chemical Engineering from NTNU in August 2012 under the Erasmus Mundus Scholarship program. His master thesis project on "Biodegradable Nano-clusters as Drug Delivery Vehicles" was carried out at ETH Zurich in Prof Morbidelli's group and in collaboration with Ugelstad Laboratory. He received his BChE(Hons.) degree from Jadavpur University, India in 2010. Recipient of JBNSTS and DAAD fellowships, Sulalit joined the Ugelstad Laboratory as a Doctoral candidate in August 2012. He is currently working under the supervision of Associate Professor Wilhelm Robert Glomm on "Smart and Multifunctional Core-shell Nano-particles (NPs) for Drug Delivery". His fields of interest include synthesis and characterization of Nano-particles, drug delivery and molecular dynamics simulation. Topic of his Thesis : Smart and Multifunctional Core-shell Nano-particles (NPs) for Drug Delivery

Ph. D. Yansong Zhao
Yansong Zhao joined Ugelstad Laboratory of NTNU as a PhD student in July 2011. He studied as a master student in Institute of Process Engineering, Chinese Academy of Sciences from August 2008 to June 2011 and received his master degree in Chemical Engineering in spring semester of 2011. He studied for 4 years in Henan University from 2004 and received his bachelor degree in Chemical Engineering in spring semester of 2008.
His research interests are waxy crude oil transportation, oil additives, ionic liquids, CO2 capture and catalysis. He has published 10 papers in Ind. Eng. Chem. Res., Energy & Fuels, Int. J. Greenhouse Gas Control, J. Chem. Eng. Data, Fluid Phase Equilib., Chem. Eng. Technol., Science China Chemistry, Computers and Applied Chemistry, Greenhouse Gases: Science and Technology. The papers have been cited more than 50 times. He has applied for 5 patents and attended many scientific conferences.

Ph. D. Thomas Tichelkamp
Thomas Tichelkamp studied chemistry and completed his master’s degree at the Department of Organic Chemistry, Heinrich-Heine-Universität Düsseldorf in May 2012, synthesizing organic dyes for the research on nano electronics. He joined the Ugelstad Laboratory in August 2012 as a Ph.D. student under the supervision of Prof. Gisle Øye. In the context of a project on surfactant improved low

salinity EOR (enhanced oil recovery) he focuses on the physical and chemical properties of crude oil/water interfaces.

Ph. D. Birgitte McDonagh
Birgitte finished her master of science in Biotechnology at the department of Biotechnology, NTNU June 2011. The title of her Master's thesis was: "Optimalised Carbodiimide Chemistry for RGD-coupled Alginate". She started working as a PhD-candidate at the Ugelstad laboratory August 2011. The main work on her PhD is nanoparticles and modification of proteins with nanoparticles of gold. The construct's interaction with membranes will be studied *in vitro* and *in vivo* at the dept. of Circulation and Medical Imaging. Associate professor Wilhelm Glomm is her supervisor at dept. of Chemical Engineering, and Ioanna and Axel Sandvig are her co-supervisors at the dept. of Circulation and Medical Imaging.

7.3 Project Technicians

Bicheng Gao
Bicheng Gao finished his master's degree in Chemical Engineering at NTNU in 2010 and has worked as a department engineer at Ugelstad Laboratory since then. He is working on both routine analyses and research projects.

Caterina Lesaint
Caterina Lesaint has been working as a department engineer in Ugelstad laboratory since 2006 and has been a part of many of our big research projects.

Signe Håkonsen
Signe Håkonsen was working as an engineer in Ugelstad laboratory from 2006 to February 2012. She worked with both routine analyses and research projects.

Murside Kes
Murside Kes has been working as a department engineer since April 2012. She is working on both routine analyses and research projects.

Runar Sandnes
Runar Sandnes worked as project assistant in Ugelstad laboratory from September to December 2012

May Grete Sætran
May Grete Sætran has been working as a department engineer in Ugelstad laboratory since October 2012 and is working with both routine analysis and research projects.

7.4 Alumni

Professors

Professor Emeritus Arvid Berge
– Professor Emeritus 2004

Professor Emeritus Preben Mørk
– Professor Emeritus 2007

Adjunct Professor Jan Genzer
In the fall of 1998 he joined the faculty of chemical engineering at North Carolina State University, where he is currently an assistant Professor of chemical engineering

Adjunct Professor Michael Stöcker
Dr. Stöcker currently holds two positions;
- Principal Research Scientist at SINTEF in Oslo, - Adjunct Professor (Professor II) in "Materials Science and Catalysis" at the Department of Chemical Engineering, NTNU (Norway)

Adjunct Professor John Dan Friedeman
- In the period from August 2004 to August 2007 he was Adjunct professor in the field oil and gas technology at Department of Chemical Engineering.

Post Docs and Researchers

Iva Kralova
Researcher/ Lab Manager 2006-2011
– Career after NTNU: CeMeBo

Cederic Lesaint
Researcher 2009-2010
– Career after NTNU: SINTEF

Erland L. Nordgård
– Researcher 2009-2010
– Career after NTNU: Research Scientist, Resman

Yanru Fan
- Researcher 2007-2009
- Career after NTNU:

Helene K. Magnusson
– Researcher 2005-2008
– Career after NTNU: Research Scientist, SINTEF Materials and Chemistry, Statoil R&D Centre

David Arla
– Post Doc 2006-2007
– Career after NTNU: Research Scientist, SINTEF Petroleum Research

Pål Viggo Hemmingsen
– Researcher 2002-2006
– Career after NTNU: Senior Engineer, Statoil ASA

Judit Adam
– Post Doc 2006
– Career after NTNU: Research Scientist, SINTEF Energy Research

Maria Häger
– Post Doc 2004-2006
– Career after NTNU: Sandviken, Gävle, Sweden

Marit-Helen Glomm Ese
– Researcher 2003-2006
– Career after NTNU: Research Scientist, SINTEF Energy Research

Tom-Nils Nilsen
– Senior Researcher 2005
– Career after NTNU: Research Scientist, BYGGFORSK and NTNU

Gisle Øye
– Researcher 2002-2005
– Career after NTNU: Professor, NTNU

Harald Kallevik
– Post Doc 2001-2002
– Career after NTNU: Senior Engineer, Statoil

Øystein Sæther
– Post Doc 2001-2002
– Career after NTNU: Senior Engineer, Statoil

Linn Bergflødt
– Post Doc 2001-2002
– Career after NTNU: Research Scientist, Statoil

Ph.D. Students

Nenningsland, Andreas Lyng
- Title of thesis: "Extraction, Quantification and Study of Interfacially Active Petroleum Components".
- Date of Defense: 17 December 2012

Nils van der Tuuk Opedal
– Title of thesis:"NMR as a tool to follow destabilization of water-in-oil emulsions"
– Defense of thesis: 30 September 2011
– Career after NTNU: SINTEF

Klodian Xhanari
– Title of thesis:"Nanosized cellulose fibrils as stabilizers of emulsions
– Defense of thesis: 28 January 2011
– Career after NTNU: Teaching position in Albania

Asal Amiri
- Title of thesis: «Rheology of silica-based dispersions and Cross-sectional modeling of settling Slurries"
- Defense of thesis: October 7th 2010
- Career after NTNU: Aker Solutions

Umer Farooq
- Title of thesis: "Dynamic simulation on a thermodynamic conical basis"
- Defense of thesis: September 30th 2010
- Career after NTNU: SINTEF Petroleum Research

Erland Nordgård
– Title of thesis: "Model Compounds for Heavy Crude Oil Components and Tetrameric Acids. Characterization and Interfacial Behavior"
– Defense of thesis: September 7th 2009
– Career after NTNU: Resman

Martin Smestad Foss
– Title of thesis: "The Effect of Oil on Carbon Dioxide Corrosion Inhibition on Carbon Steel - Potential for Improved Corrosion Protection"
– Defense of thesis: January 30th 2009
– Career after NTNU: Research Scientist, Institute for Energy technology (IFE)

Ann-Mari Dahl Hanneseth
– Title of thesis: "An Experimental Study of Tetrameric Naphthenic Acids at w/o Interfaces"
– Defense of thesis: January 23rd 2009
– Career after NTNU: Research Scientist, Statoil

Anne Silset
– Title of thesis: "Emulsions (w/o and o/w) of Heavy Crude Oils. characterization, Stabilization, Destabilization and Produced Water Quality"
– Defense of thesis: November 13th 2008
– Career after NTNU: Research Scientist, Statoil

Dorota Dudasova
– Title of thesis: "Characterization of solid particle suspensions with organic coatings in oilfield produced water"
– Defense of thesis: September 19th 2008
– Career after NTNU: Research Scientist, Statoil

Simone Less
– Title of thesis: "Mechanisms of water-in-crude oil emulsion formation, stabilization and resolution by electrostatic means"
– Defense of thesis: June 25th 2008
– Career after NTNU: Research Scientist, Saudi Aramco

Ingvild A. Johnsen
– Title of thesis: "The impact of dissolved hemicelluloses on adsorption of wood resin to TMP fines"
– Defense of thesis: October 12th 2007
– Career after NTNU: Research Scientist, PFI

Martin Andresen
– Title of thesis: "Surface Modification of Micro fibrillated Cellulose"
– Defense of thesis: August 31st 2007
– Career after NTNU: Research Scientist, Borregaard Lignotech

Martin Fossen
– Title of thesis: "Aggregation, Interfacial Properties and Structural Characteristics of Asphaltene Solubility Fractions"
– Defense of thesis: August 28th 2007
– Career after NTNU: Research Scientist, SINTEF Petroleum Research

Sondre Volden
– Title of thesis: "Preparation and Characteristics of Novel Silica-Based Materials and Adsorbed Macromolecules"
– Defense of thesis: December 19th 2006
– Career after NTNU: Post Doc, Ugelstad Laboratory

Shukun Chen
– Title of thesis: "Rheological Properties of Water in Oil Emulsions and Particulate Suspensions"
– Defense of thesis: October 6th 2006
– Career after NTNU: Senior Engineer, Statoil

Andreas Hannisdal
– Title of thesis: "Particle-Stabilized Emulsions and Heavy Crude Oils. Characterization, Stability Mechanisms and Interfacial Properties"
– Defense of thesis: June 15th 2006
– Career after NTNU: Senior Engineer, FMC

Torbjørn Vrålstad
– Title of thesis: "Synthesis and characterization of cobalt-containing mesoporous model catalysts."
– Defense of thesis: December 2nd 2005.
– Career after NTNU: Research Scientist, SINTEF Petroleum Research

Øystein Brandal
– Title of thesis: "Interfacial (o/w) Properties of Naphthenic Acids and Metal Naphthenates, Naphthenic Acid Characterization and Metal Naphthenate Inhibition."
– Defense of thesis: June 29th 2005.
– Career after NTNU: Senior Engineer, Statoil

Magne Kawai Knag
–Title of thesis: "Surfactant Aggregation in Solution and on Metal Surfaces and the Impact on Corrosion Rate."
– Defense of thesis: June 23rd 2005
– Career after NTNU: Research Scientist, Origo-Process

Wilhelm Robert Glomm
– Title of thesis: "Preparation and Characterization of Nanosized Structures with Applications in Bioscience and Materials"
– Defense of thesis: June 23rd 2004
– Career after NTNU: Associate Professor, NTNU

Trond Erik Havre
– Title of thesis: "Formation of Calcium Naphthenate in Water/Oil Systems, Naphthenic Acid Chemistry and Emulsion Stability"
– Defense of thesis: November 28th 2002
– Career after NTNU: Senior Chemist, Origo-Process

Narve Aske
– Title of thesis: "Characterization of Crude Oil Components, Asphaltene Aggregation and Emulsion Stability by means of Near Infrared Spectroscopy and Multivariate Analysis"
– Defense of thesis: September 23rd 2002
– Career after NTNU: Senior Engineer, Statoil

Inge Harald Auflem
– Title of thesis: "Influence of Asphaltene Aggregation and Pressure on Crude Oil Emulsion Stability"
– Defense of thesis: August 15th 2002
– Career after NTNU: Senior Engineer, Statoil

Project technicians

Signe Håkonsen left Ugelstad Laboratory in February 2012 and started as Senior Engineer at Department of Biology, NTNU.

8.0 Instrumentation at Ugelstad Laboratory

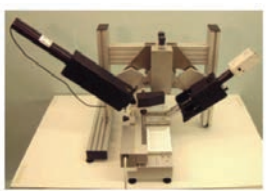
NANO ITC 2G (Isothermal Calorimeter)

Isothermal Calorimeter (TA Instruments, USA) is a thermodynamic technique that directly measures the heat released or absorbed during a molecular binding event. The ITC is used to determine thermodynamic parameters such as enthalpy (ΔH) and equilibrium constant. More particularly the application includes the study of interaction between components and the determination of self-association properties of different molecules.

Quartz Crystal Microbalance, QCM-Z500

The KSV QCM-Z500 microbalance (KSV Instruments Ltd., Finland) is a computer controlled quartz crystal microbalance based on impedance analysis for determining the frequency (f) and the quality of resonance (Q) of quartz crystals in a gaseous or liquid environment. In other words, it is a mass sensing device with the ability to measure very small changes in mass on a quartz crystal resonator in real-time. The technique also determines viscoelastic properties of surface bound layers. The QCM is used to study molecular interactions and molecular adsorption to solid surfaces in our lab.

Brewster Angle Microscope

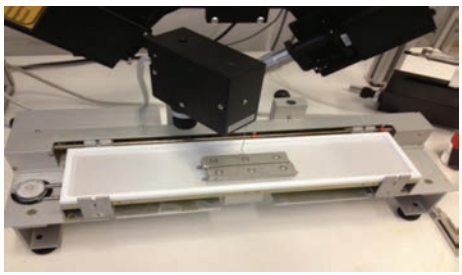


The KSV Optrel BAM300 (KSV Instruments Ltd., Finland) BAM – Brewster Angle Microscopy, is a special technique for investigation of organic thin films – Langmuir films. KSV Optrel BAM 300 is a laser powered, CCD video camera imaging microscope for real-time observation of Langmuir films on air/water interfaces or on dielectric substrates. Live video recording to the lateral resolution of 1 micron at speed of up to 25 images/sec can be seen on PC screen while data is recorded to the hard disk. Compared to other characterization methods KSV's BAM technique provides more powerful and economical means for non-invasive (non-contact) study of your thin films.

Quartz Crystal Microbalance (QCM)

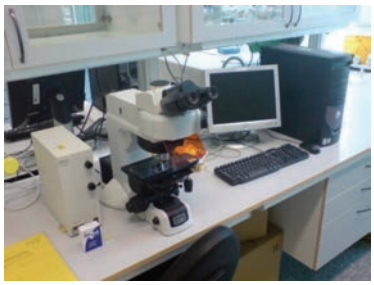
The Q-sense D300 QCM (Q-Sense AB, Sweden) is used to study molecular interactions and molecular adsorption to solid surfaces. The technique determines masses and viscoelastic properties of surface bound layers.

Langmuir-Blodgett Minitrough



The Langmuir-Blodgett Minitrough (KSV Instruments Ltd., Finland) is used to determine film properties of monolayer films at a liquid surface or interface (Langmuir films) and for deposition of mono- or multilayer onto solid substrates (Langmuir-Blodgett films).
The surface pressure is determined through the Wilhelmy-plate method and the surface area is controlled by two symmetrically moving surface barriers. Applications are studies of asphaltene-resin films, their film structure and strength, and mixed films composed of proteins and lipids related to biochemistry.

The Fluorescence Microscope (Nikon LV 100D)



The Fluorescence Microscope (Nikon LV 100D) acts as a normal microscope, but in addition has the ability to display only fluorescent species in the sample. The technique can be used to directly determine the partitioning and local concentration in an emulsion of fluorescent molecules, for example asphaltenes or resins, and particle - polymer interactions by use of energy transfer (FRET).
The microscope is equipped with a MicroPublisher 5 MP color camera with Firewire connection for image capturing."

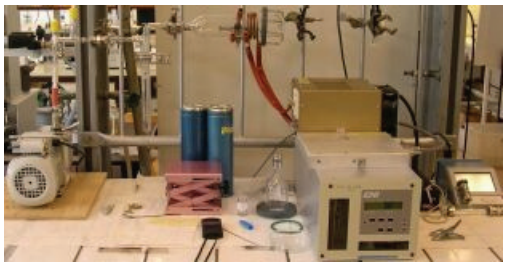
Digital Video Microscope (DVM)

The Digital Video Microscope (Scan Imaging) consists of a Nikon Eclipse ME600 microscope fitted with a CoolSNAP-Pro camera by Media Cybernetics. It is used to study properties of emulsions. Parameters of special interest are droplet size distributions, droplet concentration, droplet geometry and droplet interactions (flocculation and coalescence). It can also be used to study wax precipitation and micellar and liquid crystal behavior.

Atomic Force Microscope (AFM)

The Veeco diCaliber Atomic Force Microscope is used to map the surface topography of substrates and deposited layers (Å - mm scale). Ugelstad Laboratory has an atomic force microscope (AFM) for imaging surface morphology and measuring surface physical properties. Imaging is available in TappingMode (PhaseImaging with integrated I/O modulation plus board) for soft samples and contact mode for hard samples. Precise adhesion measurements can also be performed with the AFM.

Plasma Chamber



The Plasma Chamber (MKS Instruments) is used for chemical modification of surfaces by means of a glow-discharge. Functional groups can be implanted or thin films deposited onto the substrate.

KF Coulometer 831

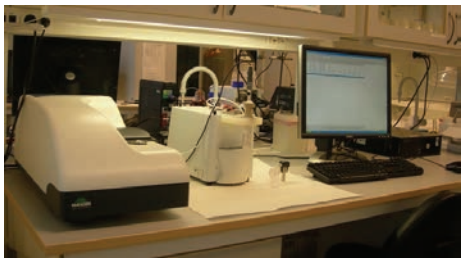
The KF Coulometer 831 (Metrohm) is used for accurately determining of very small amounts of water in petrochemicals.

Malvern Zetasizer 3000HS

Malvern Zetasizer Nano ZS (Malvern Instruments, UK) is used to study the particle size and zeta potential, and molecular weight of dispersions, emulsions, gas hydrates and so on. The connection of a titrator allows automated determination of the iso-electric point, pH and conductivity. The software also allows you to program Standard

Operating Procedures and precise temperature control for accurate measurements.

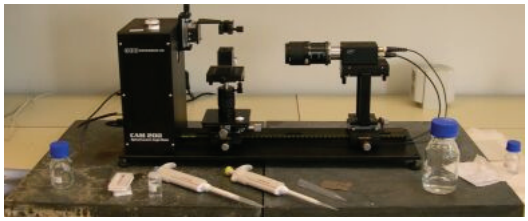
Malvern Zetasizer Nano ZS



The Zetasizer Nano ZS is a high performance two angle particle and molecular size analyzer for the enhanced detection of aggregates and measurement of small or dilute samples, and samples at very low or high concentration using dynamic light scattering with 'NIBS' optics. The connection of a titrator allows automated determination of the iso-electric point, pH and conductivity.

The instrument applies a known electrical field and measures how fast the particles move in a liquid-i.e. the velocity; using this as well as viscosity and dielectric constant the software calculates the zeta potential.

CAM 200 - Optical Surface Tension/Contact Angle Meter equipped with high-speed camera



CAM 200 (KSV Instruments Ltd., Finland) is a video camera-based contact angle meter for measurements of static or dynamic contact angles. Furthermore, surface & interfacial tension measurements can be performed using the pendant drop or raising drop technique. This unit is equipped with a FireWire camera module for measuring 100 images/second.

Critical Electric Field Emulsion Stability Cell

This is a method for testing emulsion stability for "stable" water-in-oil emulsions. An electrical field is applied to an emulsion and the electrical field is steadily increased while the current that passes through the sample is continuously measured. The critical electric field is defined as the electric field necessary to achieve a sudden increase in the current. E-crit has been developed at NTNU.

Millipore Simplicity® Personal Ultrapure Water System

The Simplicity® system (Millipore) produces water virtually free of organic and inorganic contaminants; the produced water is then suitable for applications such as buffer preparation for liquid chromatography instruments, preparation of solutions for spectrophotometry, spectroscopy, or other analytical techniques and biochemical experiments.

Analytical HPLC

The high performance liquid chromatograph system is mainly used to determine the concentrations of naphthenic acids with methodology developed at Ugelstad Laboratory. The system is built from the following modules (Shimadzu): two pumps, a degasser, a gradient mixer, an auto-injector, a column chiller/heater, an UV/vis detector and a fluorescence detector. The separation is based on affinity chromatography.

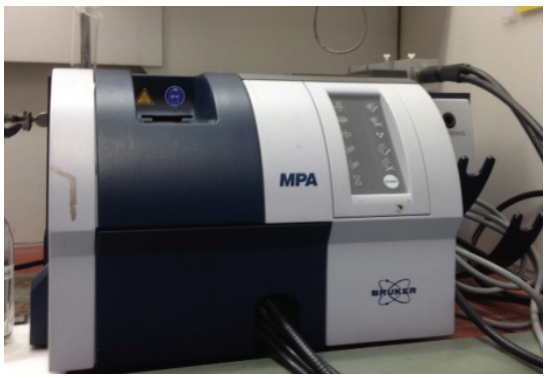
TriStar 3000 Gas Adsorption Analyzer

The TriStar 3000 (Micromeritics Instrument Corporation, USA) provides high-quality surface area and porosimetry measurements on solid materials by using the technique of gas adsorption.
The instrument is used for measuring surface area, pore size, pore volume and the hysteresis loops of mesoporous catalytic materials, and for adsorbents in general.

Fourier-Transform (Mid) Infrared Spectrophotometer

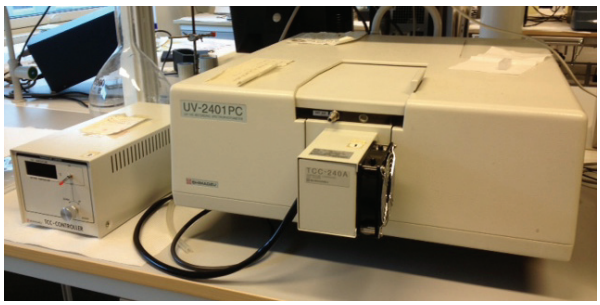
The Tensor 27 (Bruker Optics) has a spectral range from 7,500 to 370 cm^{-1} with a standard KBr beamsplitter. In order to allow for collection of mid-IR spectra of non-diluted crude oils as well as solid samples, the instrument is equipped with a Bruker Golden Gate diamond ATR (Attenuated Total Reflection) cell. The instrument has an interface with the HPLC for analysis of crude oil fractions. In addition, the instrument can be operated separately with an ATR or flow cell.

Fourier-Transform (Near) Infrared Spectrophotometer



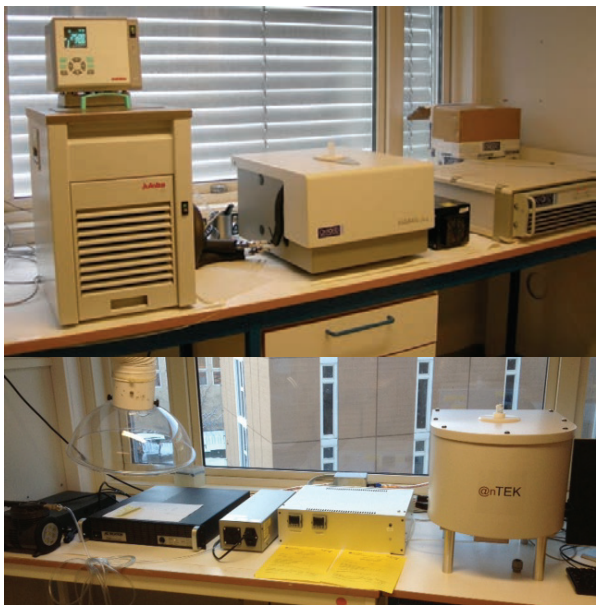
The Multi-Purpose Analyzer (MPA) (Bruker Optics) has a spectral range from 12,800 to 4,000 cm^{-1}, which allows for spectral characterization in the near-infrared regime. The instrument is used for analysis of crude oil components and studies of particle growth.

UV-vis Spectrophotometer



The UV-2401PC (Shimadzu) has a single monochromator system with a spectral range from 190-1100 nm, and is equipped with a TCC-240 temperature control unit (7-60^{0}C), and an ISR-240A Integrating sphere attachment for diffuse and total reflectance measurements from liquids and solids in the range from 240-800 nm. The low stray light/wide dynamic range/small beam size combination makes this instrument well suited to handle a variety of practical situations.

Maran 23 MHz PFG NMR

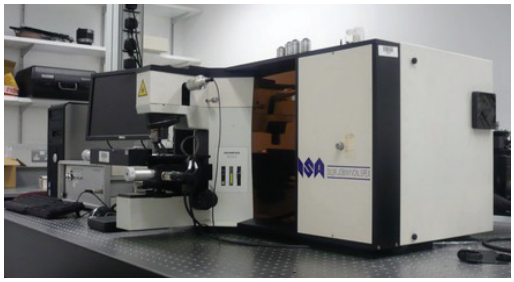


The Oxford Instruments Maran Ultra is used to study self-diffusion, droplet size distributions and emulsion stability of w/o emulsions (o/w inversion phenomenon).

Carbolite - High Temperature Furnace

The Carbolite BWF 11/13 high temperature furnace (Carbolite) is used for calcination and sintering.

Horiba Jobin Yvon LabRam High Resolution Raman Microscope



The LabRAM HR800 system provides ultra-high spectroscopic resolution and a unique wavelength range capability that provides both great flexibility and high performance. It is an integrated, simple to use, and high stability bench-top instrument designed to undertake reproducible Raman measurements at various spectral resolutions. The high resolution mode is uniquely ideal for the precise characterization of position and shape of bands of spectra of crystalline and amorphous materials e. g. oxide catalysts and carbon nanomaterials. The instrument can be used also for samples mapping (using confocal microscope and motorized stage) and for liquids analyzing (with remote fiber optic head). (UV, VIS, NIR operation) T

Density/Concentration Meter - DMA 5000 M

The DMA 5000 (Anton Paar Ltd.) density meter is used for measuring the density of solutions.
Features:
Density range - 0 to 3 g/cm^3
Permanently stored specific gravity/concentration conversions:

- Alcohol tables
- Extract/sugar tables
- API functions
- Acid/base tables

20 tables/equations for your own concentration conversions

Vertical Gravity Separator

Vertical gravity separator is an approach to investigate the differences between the emulsion stability found in batch tests and the stability found with the same fluids in a continuous system under steady state.

The advantage of the vertical setup is its low volume, approximately 12 liters for this system. Two progressive cavity pumps, one for oil and one for water are used to pump liquid from the feed separator (the bigger column). The streams are mixed before they enter the control valve in front of the test separator. The valve will create an emulsion if the differential pressure (DP) is large enough. Choking the valve gives higher DP and smaller droplets. The test separator can then be used to study the emulsion layer at different water cuts, droplet sizes, concentrations and other relevant parameters and compare with conventional batch tests.

Rheometer Physica MCR 301

The Anton Paar Physica MCR 301 rheometer in our lab is used to analyze structural properties (i.e.

viscosity, storage and loss modulus) of liquids, dispersions, emulsions and so on.

Horiba Jobin Yvon Fluorolog-3 fluorometer with TCSPC attachment

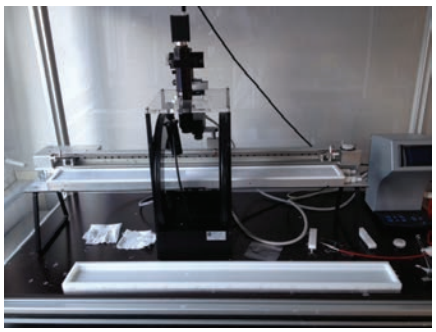
Features:
- World's most sensitive spectrofluorometer
- Can detect 50-femtomolar fluorescein
- Unique, modular system
- Interchange wide range of computer-controlled accessories: spectrometers, detectors, sources, and more!
- Totally computer-controlled
- All-reflective optics

Applications are aggregation state of high-molecular weight components related to crude oil precipitation, concentration determination at below ppm levels and protein-lipid-nanoparticle interactions in aqueous environments.

Metrohm 809 Titrando titration device(TAN)

The Titrando unit from Metrohm consists of a magnetic stirrer, a dosing device and a suitable electrode. It is used to determine the total concentration of acids (TAN)
or bases (TBN) present in a sample, by titration.

KSV Interfacial Shear Rheometer ISR 400



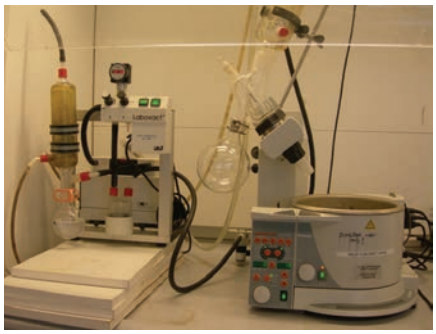
(KSV Instruments Ltd., Finland) Quantitative measurement of shear stress at fluid interfaces has long eluded researchers employing standard rotational rheometers, particularly at very low viscosity or elasticity.

With the introduction of the Interfacial Shear Rheometer (ISR 400), KSV removes the guesswork. A teflon-coated magnetic needle is floated in a half-cylinder at the gas/liquid or liquid/liquid interface, and moved with an applied magnetic field. The movement of the needle is observed microscopically, and the difference between applied force and measured position provides phase shift, viscosity, elastic and loss moduli, creep and relaxation times. Since the KSV Interfacial Shear Rheometer (KSV ISR 400) can be integrated with a standard KSV Langmuir trough, these measurements can be applied to both soluble and insoluble films.

Turbiscan Lab Expert

The Turbiscan Lab Expert (Formulaction) measures transmission and backscattering from dispersions (concentrated and dilute) as a function of time and relative vertical (y-axis) sample coordinates. This allows for determination of mean size, stability and shelf-life in real (unmodified) systems.

Laborota 4003 Rotavapor



The Laborota 4003 Rotavapor (Heidolph Instruments) is used to separate liquids by adding vacuum and heat.

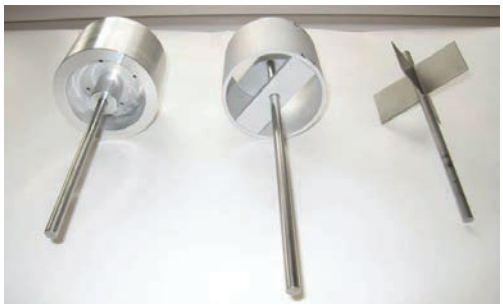
Inolab Cond Level 2, Conduct Meter

The Inolab Cond Level 2, Conduct Meter (WTW Wissenschaftlich-Technische Werkstätten GmbH) is used to measure conductivity. The analysis based on the ability a solution has to conduct electricity.

Coldfinger

The coldfinger (developed at NTNU) is used to obtain paraffin deposits on various surfaces from waxy crude oils. The device consists of a temperature controlled cylindrical vessel with rotational flow provided by an overhead rotating motor. Laminar and turbulent mixing conditions are provided by a rotating cylinder or impeller, respectively. Deposits are formed on a coupon mounted on the side wall, in thermal communication with a coolant fluid. Currently, the coldfinger is limited to shearing rates less than or equal to 602 inverse seconds.
Applications include:

1. The effect of Heat, Mass, and Momentum Transfer Conditions on Deposition Rates
2. Micro-crystalline Wax Deposition
3. Macro-crystalline Wax Deposition
4. Polymeric Inhibitor Evaluation



pH Meter

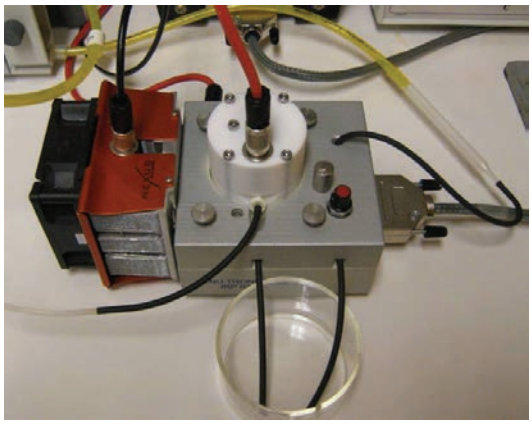
The pH meter (Mettler Toledo) is used to measure pH in solutions. The measurement is based on the activity of hydrogen ions.

Sinterface PAT-1 tensiometer

The Drop and Bubble Shape Tensiometer PAT-1 from Sinterface (Germany) allows measuring the surface and interfacial tension of liquids by the

analysis of the shape of pendant and sessile drops or buoyant and captive bubbles. By measuring the surface and interfacial tension as a function of time, the kinetic of adsorption of surfactants at the liquid/air or liquid/liquid interfaces can be studied. The rheological properties of the interface (elasticity and viscosity) can also be determined by subjecting the drop to periodic oscillation of their volume and measuring the induced variations of surface/interface tensions.

Thermal Gradient Quartz Crystal Microbalance



The Thermal Gradient Quartz Crystal Microbalance (TG-QCM) was developed jointly by NTNU and KSV Instruments (Helsinki, Finland). The TG-QCM is used to determine the mechanism of incipient wax deposition on various surface materials.
The apparatus consists of a quartz crystal which is mounted in direct fluid contact with a flow chamber. The quartz crystal is in thermal communication with a cold mass, and warm waxy oil is pumped through the chamber. Thereby, the TG-QCM is able to emulate the heat, mass, and momentum transfer conditions associated with wax deposition in oil transportation pipelines.

The apparatus consists of a quartz crystal which is mounted in direct fluid contact with a flow chamber. The quartz crystal is in thermal communication with a cold mass, and warm waxy oil is pumped through the chamber. Thereby, the TG-QCM is able to emulate the heat, mass, and momentum transfer conditions associated with wax deposition in oil transportation pipelines. Measured electromechanical oscillation parameters provide information regarding the deposition mechanism. Surface crystallization is evidence by uniform reductions in normalized resonance frequencies associated with the 3rd-11th harmonic overtones. Gel adherence is evidenced by increases in energy dissipation factors associated with the 3rd-11th harmonic overtones.

Applications include:
1. Investigating the mechanism of wax deposition from macro-crystalline and micro-crystalline wax.
2. Investigating the effect of heat transfer on the wax deposition mechanism.
3. Polymeric inhibitor evaluation
4. Investigating incipient wax by deposition from o/w and w/o emulsions.

SARA HPLC

The high performance liquid chromatograph system (Shimadzu) is used for fractionation of deasphaltenated crude oil into saturates, aromatics and resins. The automated procedure can be done either analytically or preparative. The instruments setup offers logging of UV-(dual mode) and RI-signals as well as fraction collection from these signals.

Bubble Pressure Tensiometer BP100

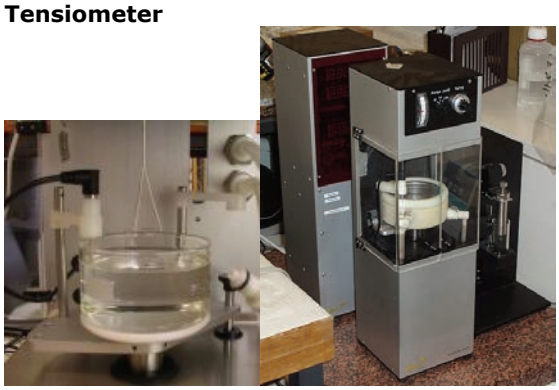
Bubble Pressure Tensiometer BP100 from Krüss (Germany) allows measuring the dynamic surface tension at constant or variable surface age (from 5 ms (high dynamic) up to 100 s (almost static)).

The instrument provides fully automatic measuring process by software controlled immersion of the

capillary. Thanks to its built-in compressor the instrument does not need an external compressed air connection. A high-precision pressure sensor determines the maximum pressure during bubble formation, from which the surface tension is calculated.

In addition to the time-dependent surface tension, the measurement also supplies the equilibrium value according to Hua & Rosen. Diffusion and adsorption coefficients can be calculated from surfactant concentration series – these are important parameters where the mobility of surfactants is concerned.

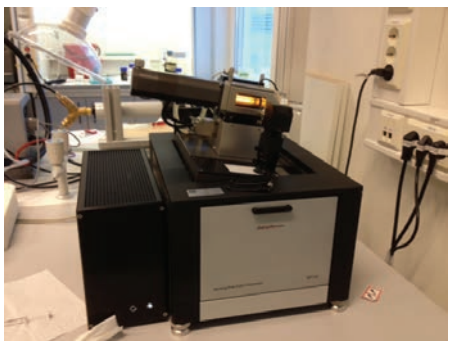
Tensiometer



The Sigma 70 tensiometer (KSV Instruments Ltd., Finland) is used for determination of:
- Surface tensions
- Interfacial tensions
- Contact angles
- Wettability of powders
- Critical micelle concentrations

The principle of this instrument is force measurements by an electrobalance as a probe (Du Nouy ring, Wilhelmy plate, sample holder, etc.) is immersed and withdrawn from liquids.

Spin Drop Video tensiometer (SVT 20)



The SVT 20 (DataPhysics Instruments GmbH, Germany) enables us measuring fluid/fluid interfacial tensions down to ultralow values. The method is based on the longitudinal deformation of a fluid bubble inside a heavier liquid in a capillary tube rotated at high velocities. By observation of the drop shape with a high resolution CCD camera the interfacial tension between the two fluids is calculated with high accuracy from mathematical models taking rotation speed, the fluids densities and temperature into account. At our laboratory this method is currently used for characterizing oil/brine/surfactant systems within a project on enhanced oil recovery. The lowest values measured with the SVT 20 at Ugelstad were in the area below 10^{-5} mN/m, quiet close to the limit of 10^{-6} mN/m which is given by the producer.

Q2000 Differential Scanning Calorimeter

Name: TA Instruments Q2000 Differential Scanning Calorimeter

Purpose: Materials and Fluid Characterization, Heat Flow Measurements, Crystallization, Precipitation, Protein Folding, Enthalpy Measurements, Asphaltene Precipitation Kinetics, Model Hydrate Formation Kinetics, Paraffin Wax Analysis, Amorphous/crystallinity determination General Usage Areas: Polymers, Colloids, and Petroleum

Q600 Thermogravimetric Analyzer with DSC

TA Instruments Q600 SDT Thermogravimetric Analyzer with DSC

Purpose: Materials and Fluids Characterization, Thermal Stability, Film Stability, Oxidation Processes, PPD/YPD Stability Qualification, Surfactant Stability Assessment, Asphaltene Pyrolysis, Demulsifier Stability Analysis, KHI/AA stability analysis, PolymerGeneral Usage Areas: Polymers, Colloids, and Petroleum

9.0 Activities emanating from the Ugelstad Laboratory

9.1 Courses

A complete description of courses at NTNU you will find on: http://www.ntnu.no/studies/courses

- **TKP4115** – Surface and Colloid Chemistry, 7.5 SP (Professor Gisle Øye)
- **TKP4130 –** Polymer Chemistry, 7.5 SP (Associate Professor Wilhelm R. Glomm)
- **TKP4520/TKP4521/TKP4525 –** Colloid and Surface Chemistry, Specialization, 22,5 SP (Professor Gisle Øye, John Daniel Friedemann, Michael Wilhelm Stöcker, Wilhelm Robert Glomm)
- **KP8134 –** Surfactants and Polymers in Aqueous Solutions, 9 SP (Professor Johan Sjöblom, Associate Professor Wilhelm R. Glomm)
- **KP8135 –** Surface, Colloid and Polymer Chemistry Special Topics, 6 SP (Professor Johan Sjöblom, Professor Gisle Øye, Associate Professor Wilhelm R. Glomm)
- **KP8129 –** Colloid Chemistry for Process Industry, 12 SP (Professor Johan Sjöblom, Professor Gisle Øye, Associate professor Wilhelm Glomm, Adjunct professor Per Stenius, Professor Kåre Larsson)

TKP4115 Surface and Colloid Chemistry (7,5 SP)

A general introduction to surface and colloid chemistry. Topics treated: Classification, preparation and kinetic properties of colloidal dispersions. Surface and interfacial tension, critical surface tensions. Surface free energy and application of thermodynamics to the two-dimensional state. Curved interfaces, Young-Laplace, Kelvin and Gibbs equations. Surfactants. Solid surfaces, contact angels, spreading, wetting and adhesion, Liquid and gas phase adsorption and capillary condensation. Charged interfaces, Gouy-Chapmans and Sterns theories. Stability of colloidal systems, kinetics of coagulation and Ostwald ripening. Emulsion and foams.

Lecturer:
- Professor Gisle Øye, NTNU

TKP4130 Polymer Chemistry (7,5 SP)

Important subjects are polymerization kinetics, step growth polymerization, free radical polymerization, ionic polymerization and coordination polymerization, the copolymer equation, polymer materials, structure, intermolecular forces, characterization methods, physical properties.

Lecturer:
- Associate Professor Wilhelm Glomm, NTNU

TKP4520/TKP4521 Colloid and Polymer Chemistry, Specialization Projects (15 SP) and TKP4525 Colloid and Polymer Chemistry, Specialization Course (7,5 SP)

The course constitutes a project work (15 sp) and adjoining course modules (7.5 SP resp). If TKP4521 (7,5 SP) project is chosen an additional topic of 7.5 sp has to be chosen, so that the total credits for the specialization will be 22.5 sp. The modules include subjects that are intended to support the project. It is assumed that the specialization topics and the project work should make a thematic homogeneity. The project work can be experimental or theoretical and will normally be connected to ongoing research projects at the department, and should preferable serve as an introduction to the diploma work in the 10th semester

Coordinator:
- Professor Johan Sjöblom, NTNU

KP8134 Surfactants and Polymers in Aqueous Solutions (7,5 SP)

The course is given every second year, first time autumn 2005. Course description, English: This course covers the properties of concentrated surfactant systems, simple polymer (including protein) systems, and the properties of mixed surfactant-surfactant and surfactant-polymer systems. For simple surfactant systems, topics covered include mechanisms of self-assembly, interfacial behavior (including adsorption at solid surfaces), phase behavior of concentrated surfactant systems – including binary and ternary phase diagrams, novel surfactants, and micro-emulsions. For simple polymer solutions, topics such as molecular weight, phase separation, the solubility parameter, theta temperature and Flory-Huggins theory for the phase behavior of polymer solutions are covered. The main emphasis of this course is given to the properties of mixed systems – surfactant-surfactant systems and surfactant polymer (including surfactant-protein) systems, including surfactant-polymer interactions, critical association concentrations, phase behavior and

rheology of mixed systems, and technical applications. Examples from current research are provided throughout the course.

Lecturer:
- Professor Johan Sjöblom, NTNU
- Associate Professor Wilhelm Glomm, NTNU

KP8135 Surface, Colloid and Polymer Chemistry Special Topics (7,5 SP)

The course will first be taught fall 2006, and thereafter either during the fall or spring semester when needed. Descriptions of courses and their objectives are divided according to topic. Here, only two topics are listed, however; more topics may be added according to the need and accumulated interest. This course consists of two independent subjects: Part A and B, which will be taught individually.

Part A: Soft Condensed Matter on Surfaces. This course is intended to provide overview over several outstanding research topics from soft condensed matter that are relevant to nanoscience and nanotechnology.

Part B: Characterization of Colloidal Systems. This topic covers theoretical and applied aspects of a selection of experimental techniques meant for characterization of colloidal systems (including polymers). The main emphasis will be put on experimental techniques developed specifically for characterization of the colloidal domain, however; where conventional techniques such as UV-vis and near-IR are described, the course will focus on aspects and applications unique to colloidal dispersions, such as colloidochromism.

Lecturer:
- Professor Gisle Øye, NTNU
- Associate Professor Wilhelm Glomm, NTNU

KP8129 Colloid Chemistry in the Process Industry (7,5 SP)

• Colloid chemistry in the oil industry (3SP)

This course throws light on the important role that colloid chemistry has in oil technology offshore. Phenomenon that are described in the course are PVT diagrams, mechanisms for asphaltene precipitation at low pressures (or changed solubility conditions), separation of water / oil / gas, emulsion problems (formation of emulsions, natural transportability and stabilization of suspensions) as well as functionality of various oil field chemicals (inhibitors, demulsifiers, kinetic inhibitors, defoamers, wettability chemicals etc.)

Lecturers:
– Professor Johan Sjöblom, NTNU
– Dr. NN (from oil industry)

• Colloid chemistry in the pulp and paper industry (3SP)

This course throws light on the important role that colloid chemistry has within papermaking. Phenomena that are treated in the course are the solubility properties of polyelectrolyte as well as their adsorption to solid surfaces such as cellulose fibers, dissolved wood substances and colloids in the circulation water, flocculation, retention and de-watering, spreading, wetting and adhesion, surface chemistry at dry strength additives, interactions between printing inks and paper surfaces, foam stabilizers, characterization of paper and fibers by spectroscopic and microscopic techniques.

Lecturer:
– Professor Per Stenius, Helsinki University of Technology

• Advanced instrumentation in colloid chemistry (1,5 SP)

This course deals with modern and advanced instrumentation such as AFM (Atomic Force Microscopy), QCM (Quartz Crystal Microbalance), Langmuir-Blodgett, NIR (Near Infrared) spectroscopy, FT-IR (Fourier Transformed Infrared) spectroscopy, HPLC (High Pressure Liquid Chromatography), Zeta-sizer, SARA (Saturates, Aromatics, Resins, Asphaltenes) fractionation, high pressure instrumentation, plasma chemical modification, rheology (bulk and interface) NMR (Nuclear Magnetic Resonance).

Lecturer:
– Professor Gisle Øye, NTNU

9.2 Exchange Programs

Students and Researchers at the Ugelstad Laboratory are encouraged to participate in research at other well renowned laboratories. Currently, the laboratory has exchange programs with:

• Department of Chemical and Materials Engineering, University of Alberta, Canada

• Department of Chemical Engineering, North Carolina State University, USA

• International Program in Chemical Applications of Nanoparticles: Nanotechnology Undergraduate Education
- Exchange program initiated by the National Science Foundation (NSF)
- Collaboration with the following institutions:
1) Department of Chemistry, North Carolina State University (USA)
2) Department of Chemistry, Colorado State University (USA)
3) Institute for Surface Chemistry, Royal Institute of Technology (Sweden)
4) Department of Physical Chemistry 1, Lund University (Sweden)
5) Department of Petroleum Engineering, University of Tulsa, USA

The Ugelstad Laboratory also hosts visiting researchers and lecturers

9.2.1 Visiting students

Name	**University/Country**
Chapon, Maéva	National Polytechnic Institute of Lorraine, France
Engelbeen, Jeroen	Ghent University, Belgia
Freychet, Guillaume Leon	University Pierre and Marie Curie, France
Garcia, Vitor	Federal University of Rio Grande do Norte, Brazil
Kawale, Durgesh	Delft University ot Technology, The Netherlands
Lemainque, Joseph Francois Vincent	University Paris Sud Orsay, France
Morán Rico, Elena	Universidat Politechnica de Valencia, Spain
Nascimento, Priscila	Federal University of Paraná, Brazil
Negre, Leo Andre	University Pierre and Marie Curie, France
Orlandi, Ezequiel	Federal University of Paraná, Brazil
Pattyn, Ibe	Ghent University, Belgium
Pichler, Birgit Elvira	Graz University of Tehcnology, Austria
Reynders, Pieter	K.H. Kempen University Collegen Belgium
Staudinger, Christoph	Graz University of Tehcnology, Austria

9.3 Publications

9.3.1 Publications 2012

Al Bawab A, Bozeya A, Friberg Stig E;
Spontaneous Emulsification and Phase Equilibria in the System Water, Ethanol and Benzene. J dispersion Sci. Technol. In Press

Al-Bawab A, Bozey A, Friberg S E, Ge L, Guo R;
Spontaneous Emulsification in the System Water/Benzene/Ethanol: Phase Equilibria and Emulsification Mechanism. Colloids Surf. In Press

Amiri Asal, Nuland Sven, Øye Gisle, Sjøblom Johan;
Use of a Cross-Sectional Model for Determining Rheology in Settling Slurries: Effect of Solvent Particle Size, and Density. Journal of Dispersion Science and Technology 2012 ;Volum 33.(9) s. 1336-1345

Amiri Asal, Øye Gisle, Sjøblom Johan;
Stability and Flow-Induced Flocculation of Fumed Silica Suspensions in Mixture of Water-Glycerol. Journal of Dispersion Science and Technology 2012; Volum 33.(8) s. 1247-1256

Anthonsen, Henrik Walbye, Sørland Geir Humborstad, Zick Klaus, Sjøblom Johan, Simon Sebastien;
Quantitative Recovery Ordered (Q-ROSY) and Diffusion Ordered Spectroscopy using the Spoiler Recovery Approach. Diffusion Fundamentals 2012; Volum 17.(1) s. 1-12

Bandyopadhyay S, Singh G, Lystvet S M, Volden S, Strand S, Glomm W R;
Smart Nanoparticles (NP) for Drug Delivery; 5th Asian Particle technology Symposium, 02-07-2012 - 05-07-2012

Baumann Anne, Gjerde Anja Underhaug, Ying Ming, Svanborg Catharina, Holmsen Holm A, Glomm Wilhelm, Martinez Aurora, Halskau jr Øyvind;
HAMLET forms annular oligomers when deposited with phoshpolipid monolayers. Journal of Molecular Biology 2012 ;Volum 418.(1-2) s. 90-102

Bozeya Ayat, Al-Bawab Abeeer, Friberg Stig E, Miller Clarence A;
Spontaneous Emulsification and Phase Equilibria in the System Water, Ethanol and Benzene. J Dispersion Sci. Technol. In Press

Bozeya Ayat, Al-Bawab Abeeer, Friberg Stig E, Ge Lingling, Rong Guo.
Spontaneous Emulsification Between Incompatible Aqueous Solutions in the Water/Ethanol/Benzene System. J Colloid Interface Sci. In Press

Eftekhardadkhah Mona, Gawel Bartlomiej, Lesaint Caterina, Øye Gisle;
Spreading of crude oil droplets at air/water interface: the effect of water ionic composition and oil fractions. EUFOAM 2012; 2012-07-08 - 2012-07-11

Friberg Stig E, Friberg Susan H;
Emulsion formation. Encyclopedia colloid Interface Sci. In Press. DOI 10.1007/978-3-642-20665.8

Gaweł B, Lambrechts K, Øye G;
Preparation and Characterization of $Au/CeO_2–Al_2O_3$ Monoliths
Materials Science and Engineering B 177 (2012) 575– 580

Gaweł B, Gaweł K, Hobæk T C, Yasuda M, Øye G;
A Simple Semi Sol-gel Method for Preparation of Alumina Monoliths with Hierarchical Pore Structures. Materials Chemistry and Physics;137 (2012), 414-420

Gaweł B, Lambrechts K, Gawel K, Øye G;
One-pot Synthesis of Gold Nanoparticle Functionalised Mesoporous Silica – the Double Role of a Tri-block Copolymer and Chitosan. Microporous and Mesoporous Materials, 164 (2012), 32-37

Gawel Bartlomiej, Lesaint Caterina, Bandyopadhyay Sulalit, Øye Gisle;
The mutual influence of brine and crude oil composition on interfacial properties of crude oil/brine systems. 26th Conference of the European Colloid and Interface Society (ECIS2012); 2012-09-02 - 2012-09-07

Ge L, Vernon M, Simon S, Maham Y, Sjöblom J, Xu Z;
Interactions of divalent cations with tetrameric acid aggregates in aqueous solutions. Colloids and Surfaces A: Physicochemical and Engineering Aspects, vol. 396, 2012, p. 238-245.

Glomm Wilhelm;
Gull for kroppen. Gemini [Avis] 2012-06-01

Glomm Wilhelm;
The Langmuir technique: Solving your problems one monolayer a time. NTNU NanoLab Seminarseries; Spring 2012; 2012-04-24

Glomm Wilhelm, Volden Sondre, Lystvet Sina Maria;
Realfag som grunnlag for medisinsk forskning. Foredrag for Samarbeidsforum, NTNU; 2012-02-14

Grimes B;
Population Balance Model for Batch Gravity Separation of Crude Oil and Water Emulsions. Part I: Model Formulation. Journal of Dispersion Science and Technology, 33:578–590, 2012

Grimes Brian Arthur, Sjøblom Johan;
Population balance modeling of batch oil-water separations: Prediction of Crude oil separation dynamics measured by low frequency NMR experiments. Thirteenth International Conference on Petroleum Phase Behavior and Fouling (PETROPHASE 2012); 2012-06-10 - 2012-06-14

Hammervik Martin, Glomm Wilhelm;
Dette er bakterien som lager gull. NRK, Vitenskap-og-teknologi [Internett] 2012-10-04

Hasinovic H, Friberg S E, Kovach I, Koetz J;
Equilibrium Janus Drops. J Dispersion Sci. Technol. In Press.

Honda Hiroshi, Foss Martin, Tomoe Yasuyoshi, Sunaba Toshiyuki, Watanabe Tomoko;
Corrosion Behaviors of CRAs Under CO2-H2S Environment with Organic Acids
CORROSION 2012 Conference & Expo

Johnsen Bernt Brønmo, Stavnes Signe Marie, Olsen Torbjørn, Thorvaldsen Tom, Glomm Wilhelm;
Preparation and characterisation of epoxy/alumina polymer nanocomposites. 15th European Conference on Composite Materials; 2012-06-24 - 2012-06-28

Kaombe Divina Donald, Lenes Marianne, Toven Kai, Hagg May-Britt, Glomm Wilhelm;
Turbiscan as a Tool for Studying Phase Separation Tendency of Pyrolysis Oil. 20th European Biomass Conference and Exhibition; 2012-06-22

Kelesoglu Serkan, Pettersen Bjørnar H, Sjøblom Johan;
Characterization of Water-in-North Sea Acidic Crude Oil Emulsions by Means of Rheology, Droplet Size, and Laminar Flow in Pipeline. Journal of Dispersion Science and Technology 2012 ;Volum 33.(4) s. 536-548

Kelesoglu S, Pettersen B H, Sjöblom J;
Flow Properties of Water-in-North Sea Heavy Crude Oil emulsions
Journal of Petroleum Science & Engineering, 100, pp. 14-23. (2012)

Kelesoglu Serkan, Volden Sondre, Kes Murside, Sjøblom Johan;
Adsorption of Naphthenic Acids onto Mineral Surfaces Studied by Quartz Crystal Microbalance with Dissipation Monitoring (QCM-D). Energy & Fuels 2012 ;Volum 26.(8) s. 5060-5068

Knudsen Agnethe, Nordgård Erland, Diou Odile, Sjøblom Johan;
Methods to Study Naphthenate Formation in w/o Emulsions by the Use of a Tetraacid Model Compound. Journal of Dispersion Science and Technology 2012 ;Volum 33.(10) s. 1514-1524

Kovalchuk K, Grimes B A;
Molecular Dynamic Simulation of Water-Oil Interfaces with adsorbed Naphthenic Acids. In preparation.

Kovalchuk Karina, Sjøblom Johan, Grimes Brian Arthur;
Molecular dynamic study of tetra-naphthenic acids at water-oil-interface. Twenty-sixth Conference of the European Colloid and Interface Society; 2012-09-02 - 2012-09-07

Kovalchuk Karina, Sjøblom Johan, Grimes Brian Arthur;
Molecular dynamics simulation of tetra-naphthenic acids at water/oil interfaces: Adsorption dynamics and interactions with mono-acids. Thirteenth International Conference on Petroleum Phase Behavior and Fouling (PETROPHASE 2012); 2012-06-10 - 2012-06-14

Kumar Lalit, Zhao Yansong, Safieva Jamilia, Ali Hassan, Grimes Brian Arthur, Sjøblom Johan;
Next-generation pipeline restart modeling: From theory to commercial application. Thirteenth International Conference on Petroleum Phase Behavior and Fouling (PETROPHASE 2012); 2012-06-10 - 2012-06-14

Leino T, Raulio M, Stenius P, Laine J, Salkinoja-Salonen M;
Pseudoxanthomonas bacteria that drive deposit formation of wood extractives can be flocculated by cationic polyelectrolytes. J. Ind. Microbiol. Biotech. 39:1 (2012) 105-114.

Lystvet Sina Maria, Volden Sondre, Halskau jr Øyvind, Glomm Wilhelm;
Interactions between BSA-gold nanoparticle constructs and a phospholipid monolayer. French-Norwegian Interdisciplinary Symposium on Nano and Micro Frontiers in Biology and Medicine; 2012-08-31 - 2012-09-02

Nordgård E L, Simon S, Sjöblom J;
Interfacial Shear Rheology of Calcium Naphthenate at the Oil/Water Interface and the Influence of pH, Calcium and in Presence of a Model Monoacid. Journal of Dispersion Science and Technology 2012; Volum 33.(7) s. 1083-1092

Nordgård E L, Ahmad J, Simon S, Sjöblom J;
Oil-water partitioning of a synthetic tetracarboxylic acid as a function of pH. Journal of Dispersion Science and Technology 2012 ;Volum 33.(6) s. 871-880

Safieva Jamilia O, Paso Kristofer G, Safieva Ravilya, Rustem Z, Syunyaev Z;
Adsorption and Aggregation of Asphaltenes in Petroleum Dispersed Systems
Book Chapter: Crude Oil Emulsions- Composition Stability and Characterization (2012)

Skartlien R, Grimes B A, Sjöblom J, Sollum E;
Coalescence Kinetics in Surfactant Stabilized Emulsions in Decaying Turbulence: Evolution Equations from Direct Numerical Simulations.
In preparation

Skartlien R, Grimes B, Meakin P, Sjöblom J, Sollum E;
Coalescence kinetics in surfactant stabilized emulsions: evolution equations from direct numerical simulations, J. Chem. Phys. 137, 214701. doi: 10.1063/1.4768243 (2012)

Skartlien R, Sollum E, Akselsen A, Meakin P;
Direct numerical simulation of surfactant stabilized emulsions - Morphology and shear viscosity in starting shear flow, Rheologica Acta, July 2012, Volume 51, Issue 7, pp 649-673

Simon S, Reisen C, Bersås A, Sjöblom J;
Reaction between tetrameric acids and Ca2+ in Oil/Water system. Industrial and Engineering Chemistry Research, vol. 51, 2012, p. 5669−5676.

Simon S, Knudsen K D, Nordgård E L, Reisen C, Sjöblom J;
Water Phase Association and Aggregation of Tetrameric Acids by Small-Angle Neutron Scattering Journal of Colloid and Interface Science 2013 ; Volum 394.(1) s. 75-81

Singh Gurvinder, Sandvig Ioanna, Mørch Yrr Asbjørg, Glomm Wilhelm;
Multifunksjonelle nanopartikler skreddersydd til biomedisin. Divisjon for Innovasjon, Forskningrådet; 2012-06-28

Sjöblom Johan, Aske Narve, Viitala Tapani, Paso Kristofer;
Wax Deposition Prevention by Surface Modifications: Materials Evaluation
01/2012; Book Chapter: Encyclopedia of Surface and Colloid Science, Publisher: Taylor & Francis

Teklebrhan R B, Ge L, Bhattacharjee S, Xu Z, Sjöblom J;
Probing Structure-Nanoaggregation Relations of Polyaromatic Surfactants: A Molecular Dynamics Simulation and Dynamiv Light Scattering Study. J Phys. Chem. 2012, In press.

Tsuchiya Kiyoto, Kozawa Daichi, Sakka Tetsuo, Øye Gisle, Fukami Kazuhiro, Ogata Yukio H;
Interparticle interactions and structure formation of colloidal particles at oil-water interface. International Association of Colloid and Interface Scientists (IACIS2012); 2012-05-13 - 2012-05-18

Volden, Sondre; Eilertsen, Jan Lasse; Singh, Gurvinder; Wang, Wei; Zhu, Kaizheng; Nyström, Bo; Glomm, Wilhelm.
Effect of Charge Density Matching on the Temperature Response of PNIPAAM Block Copolymer-Gold Nanoparticles. The Journal of Physical Chemistry C 2012 ;Volum 116.(23) s. 12844-12853

Volden Sondre, Lystvet Sina Maria, Halskau jr Øyvind, Glomm Wilhelm;
Generally applicable procedure for in situ formation of fluorescent protein-gold nanoconstructs. RSC Advances 2012 ;Volum 2. s. 11704-11711

Volden Sondre, Ese Marit-Helen, Zhu Kaizheng, Yasuda Masahiro, Nyström Bo, Glomm Wilhelm;
Interactions between bovine serum albumin and Langmuir films composed of charged and uncharged poly(N-isopropylacrylamide) block copolymers. Colloids and Surfaces B: Biointerfaces 2012 ;Volum 98. s. 50-57

Wang J, Lu D, Sjöblom J, Xu Z, Zeng H;
Molecular Interactions of a Polyaromatic Surfactant C5Pe in Aqueous Solutions Studied by Surface Forces Apparatus (SFA). J Phys. Chem. 2012, Submitted.

Wang Jing, Opedal Nils van der Tuuk, Lu QY, Xu Zhenghe, Zeng Hongbo, Sjøblom Johan;
Probing Molecular Interactions of an Asphaltene Model Compound in Organic Solvents Using a Surface Forces Apparatus (SFA). Energy & Fuels 2012 ;Volum 26.(5) s. 2591-2599

Xhanari Klodian, Syverud Kristin, Chinga-Carrasco Gary, Paso Kristofer, Stenius Per;
Reduction of water wettability of nanofibrillated cellulose by adsorption of cationic surfactants Journal: Cellulose, Volume 18, Issue 2, Pages 257-270 (2012)

Zhao Yansong, Kumar Lalit, Paso Kristofer Gunnar, Ali Hassan, Safieva Jamilia, Sjøblom Johan;
Gelation and Breakage Behavior of Model Wax-Oil Systems: Rheological Properties and Model Development. Industrial & Engineering Chemistry Research 2012 ;Volum 51.(23) s. 8123-8133

Zhao Yansong, Kumar Lalit, Paso Kristofer Gunnar, Safieva Jamilia, Sariman MZB, Sjøblom Johan;
Gelation Behavior of Model Wax-Oil and Crude Oil Systems and Yield Stress Model Development. Energy & Fuels 2012 ;Volum 26.(10) s. 6323-6331

Zhao Yansong, Kumar Lalit, Paso Kristofer, Safieva Jamilia Subramanian, Sreedhar Sariman, Mior Zaiga B, Sjöblom Johan;
Controlled Shear Stress and Controlled Shear Rate Non-Oscillatory Rheological Methodologies for Gel Point Determination. Energy & Fuels. (*Under Revision*)

Øye, Gisle.
Bubbles and drops. How the surroundings and their ageing influence their properties - Interfacial properties, coalescence, influence of the chemistry

9.3.2 Publications 2011

Sørland G H, Anthonsen H W, Zick K, Sjöblom J, Simon S;
A Spoiler Recovery Method for Rapid Diffusion Measurements. Diffusion-fundamentals.org, vol. 15, 2011, p. 1-9.

Opedal N, Kralova I, Lesaint C, Sjöblom, J;
Enhanced Sedimentation and Coalescence by Chemicals on Real Crude Oil Systems. Energy and Fuels. Vol 25 (2011) 923-934.

Coutinho R Pinto J, Nele M, Hannisdal A, Sjöblom J;
Evalutation of Water-in Crude Oil Emulsions Using Critical Electric Field: Effect of Emulsion Preparation Procedure and Crude Oil Properties. Journal of Dispersion Science and Technology. Vol 32 (2011) 923-934.

Opedal M T, Stenius P, Johansson L, Hill J, Sandberg C;
Removal of Dissolved and Colloidal Substances in Water from Compressive Pre-Treatment of Chips Using Dissolved Air Flotation. Pilot trial. Nordic Pulp Paper Res. J. 26:4 (2011) 364-371.

Wang J, Opedal N v d T, Lu Q, Xu Z, Zeng H, Sjöblom J;
Probing Molecular Interactions of an Asphaltene Model Compound in Organic Solvents Using a Surface Forces Apparatus (SFA). 2011, Energy and Fuels.

Amiri A, Øye G, Sjöblom J;
Temperature and pressure effects on stability and gelation properties of silica suspensions.
Colloids and Surfaces A: Physicochemical and Engineering Aspects 2011 ;Volum 378.(1-3) s. 14-21

Farooq U, Asif N, Tweheyo M T, Sjöblom J, Øye G;
Effect of Low-Saline Aqueous Solutions and pH on the Desorption of Crude Oil Fractions from Silica Surfaces. Energy & Fuels 2011 ;Volum 25.(5) s. 2058-2064

Farooq U, Sjöblom J, Øye, G;
Desorption of Asphaltenes from Silica-Coated Quartz Crystal Surfaces in Low Saline Aqueous Solution. Journal of Dispersion Science and Technology 2011; Volum 32.(10) s. 1388-1395

Farooq U, Tweheyo M T, Sjöblom J, Øye G;
Surface Characterization of Model, Outcrop, and Reservoir Samples in Low Salinity Aqueous Solutions. Journal of Dispersion Science and Technology 2011; Volum 32.(4) s. 519-531

of water and oil. Produced Water Management 2012; 2012-01-24 - 2012-01-25

Kralova I, Sjöblom J, Øye G, Simon S, Grimes B A, Paso K G;
Heavy Crude Oils/Particle Stabilized Emulsions. Advances in Colloid and Interface Science 2011; Vol. 169. s. 106-127

Paso K, Viitala T, Aske N, Sjöblom J;
Wax Deposition Prevention by Surface Modifications: Materials Evaluation. Encyclopedia of Surface and Colloid Science.

Zhao Y, Kumar L, Paso K, Ali H, Safieva J, Sjöblom J;
Gelation and Breakage Behavior of Model Wax-Oil Systems: Rheological Properties and Model Development. Industrial and Engineering Chemistry Research.

Krueckert K, Oschmann H, Paso K, Sjöblom J;
The Effect of Pour Point Depressants on the crystallization of paraffinic solutions. Journal TBD.

Safieva J, Paso K, Safieva R Z, Syunyaev R Z;
Adsorption and Aggregation of Asphaltenes in Petroleum Dispersed Systems. Book Chapter in Crude Oil.

Nenningsland A, Gao B, Simon S, Sjöblom J;
Comparative study of Stabilizing Agents for Water-in-Oil Emulsions, Energy and Fuels, vol. 25, 2011, p. 5746–5754.

Sørland G H, Anthonsen H W, Zick K, Sjöblom J, Simon S;
A Spoiler Recovery Method for Rapid Diffusion Measurements. Diffusion-fundamentals.org, vol. 15, 2011, p. 1-9.

Ge L, Simon S, Grimes B, Nordgård E L, Xu Z, Sjöblom J;
Formation of Vesicles and Micelles in Aqueous Systems of Tetrameric Acids as Determined by Means of Dynamic Light Scattering. Journal of Dispersion Science and Technology, vol. 32, 2011, p. 1582-1591.

Lesaint C, Vrålstad H, Spets Ø, Simon S, Hannisdal A, Lundgaard L, Lihnjell D, Sjöblom J;
Analysis of Crude Oils by Frequency Domain Spectroscopy- Effect of Composition and Physical Properties on Conductivity and Dielectric Response. Journal of Dispersion Science and Technology, vol. 32, 2011, p. 874-880.

Simon S, Pierrard X, Sjöblom J, Sørland G H;
Separation Profile of Model Water-in-Oil Emulsions followed by Nuclear Magnetic Resonance (NMR) Measurements: Application Range and Comparison

with a Multiple-light Scattering Based Apparatus, Journal of Colloid and Interface Science, vol. 356, 2011, p. 352–361.

Sjöblom J, Stenius P, Simon S, Grimes B A;
Emulsion Stabilization: More than Monolayers, in Encyclopedia of Colloid and Interface Science. Book chapter, T. Tadros Editor. In preparation

Opedal M T, Stenius P, Johansson L;
Review: Colloidal Stability and Removal of Extractives from Process Water in Thermomechanical Pulping. Nordic Pulp Paper Res. J. 26:4 (2011) 248-257.

Opedal M T, Stenius P, Johansson L, Hill J;
Flocculation of Colloidal Wood Extractives in Process Water from Precompression of Chips in Thermo-Mechanical Pulping. Nordic Pulp Paper Res. J. 26:1 (2011) 64-71.

Opedal M T, Stenius P, Gregersen Ø, Johansson L, Hill J;
Removal of Dissolved and Colloidal Substances from TMP Process Water using Dissolved Air Flotation. Laboratory Tests. Nordic Pulp Paper Res. J. 26:1 (2011) 72-80.

Leino T, Raulio M, Stenius P, Laine J, Salkinoja-Salonen M;
Pseudoxanthomonas Bacteria that Drive Deposit Formation of Wood Extractives can be Flocculated by Cationic Polyelectrolytes. J. Ind. Microbiol. Biotech. 39:1 (2012) 105-114.

Leino T, Raulio M, Salkinoja-Salonen M, Stenius P, Laine J;
Adsorption of Bacteria and Polycations on Model Surfaces of Cellulose, Hemicellulose and Wood Extractives Studied by QCM-D. Colloids Surfaces B. Biointerf. 86:1 (2011) 131-139.

Xhanari K, Syverud K, Chinga-Carrasco G, Paso K, Stenius P;
Reduction of Water Wettability of Nanofibrillated Cellulose by Adsorption of Cationic Surfactants. Cellulose 18:2 (2011) 257-270.

Xhanari K, Syverud K, Chinga-Carrasco G, Paso K, Stenius P;
Structure of Nanofibrillated Cellulose Layers at the O/W Interface. J. Colloid Interf. Sci. 356:1 (2011) 58-62.

Xhanari K, Syverud K, Stenius P;
Emulsions Stabilized by Microfibrillated Cellulose: The effect of Hydrophobization, Concentration and O/W ratio. J. Disp. Sci. Techn. 32:3 (2011) 447-452.

Syverud K, Xhanari K, Chinga-Carrasco G, Yu Y, Stenius P;
Films Made of Cellulose Nanofibrils: Surface Modification by Adsorption of a Cationic Surfactant and Characterization by Computer-Assisted Electron Microscopy. J. Nanopart. Res. 13:2 (2011) 773-782.

Xhanari K, Paso K G, Chinga-Carrasco G, Syverud K, Stenius P;
Structure of Nanofibrillated Cellulose Monolayers at the Oil/Water Interface. International Conference on Nanotechnology for the Forest Products Industry 2010 , TAPPI, Atlanta, pp. 372-393.

Foss M, Kelesoglu S;
Development of an Artificial Oil to Match Conventional Heavy Crude Oil Properties in Pipeline Multiphase Flow. Oilfield Chemicals Symposium, Geilo, 28-30 March 2011.

Nyborg R, Foss M;
Experience with an Under Deposit Corrosion Test Method with Galvanic current Measurements. CORROSION/2011, Paper No. 11259, Houston, March 13-17 2011.

Svenningsen G, Foss M, Nyborg R, Sherik A, Lewis A L;
Laboratory Simulation of Black Powder Formation in Flowing Gas with Water Condensation. CORROSION/2011, Paper No. 11086, Houston, March 13-17 2011.

Honda H, Foss M, Sunaba T, Tomoe Y, Watanabe T;
Corrosion Behavior of CRAs under CO2-H2S Environment with Organic Acids. CORROSION/2012, Paper No. C2012-0001129, Salt Lake City, March 11-15 2011.

Foss M, Palencsar A;
Characterization of the Effect of Oil on Co2 Corrosion Inhibitor Efficiency, Eurocorr 2011, Paper No. 4798, Stockholm September 5-8 2011.

Foss M, Palencsar A, Sjöblom J;
EIS Study of the Effect of Oil on the Inhibitor Efficiency of an Imidazoline Salt on CO2 corrosion of Carbon Steel, In Preparation, Will be submitted to Corrosion Science.

Wen H, Rundgren I, Glomm W R, Halskau Ø;
Benchmarking Different BAMLET-like Preparations with Respect to *Tryptophan Exposure, Interfacial Activity, and Effect on Cell Viability., J. Bioanalysis Biomedicine, 2011, S5, 003

Lystvet S M, Volden S, Halskau Ø, Glomm W R;
Immobilization onto Gold Nanoparticles Alters Alpha-Lactalbumin Interaction with Pure and Mixed Lipid Monolayers, Soft Matter, 2011, 7 (24), 11501-11509

Yasuda M, Fujimura S, Tsugita N, Masui A, Glomm W R, Ogino H, Yoshida H;
Sub-critical Water Hydrolysis of Gelatin 5 in Used X-ray and Lith Film. J. Chem. Eng. Japan, 2011, 44 (12), 963-968.

Hirabayashi Y, Hatta Y, Tsuboi I, Harada T, Aizawa S, Ono K, Glomm W R, Yasuda M.
Novel Three-Dimensional Long-Term Bone Marrow Culture System using Polymer Particles with Grafted Epoxy Polymer Chains Supports the Proliferation and Differentiation of Hematopoietic stem Cells. Exp. Biol. Medicine, 2011, 236 (11), 1342-1350.

Volden S, Genzer J, Zhu K Z, Ese M-H G, Nyström B, Glomm W R;
Charge- and Temperature-Dependent Interactions Between Anionic Poly(N-isopropylacrylamide) Polymers in Solution and a Cationic Surfactant at the Water/Air Interface. Soft Matter, 2011, 7 (18), 8498-8507.

Volden S, Trinh L T T, Kjøniksen A-L, Yasuda M, Nyström B, Glomm W R;
Gold Nanoparticles affect Thermoresponse and Aggregation Properties of Mesoscopic Immunoglobulin G clusters. J. Phys. Chem. C, 2011, 115 (23), 11390-11399.

Grimes B A, Dorao C A, Opedal N v d T, Kralov I, Sørland G H, Sjöblom J;
Population Balance Model for Batch Gravity Separation of Crude Oil and Water Emulsions. Part II: Comparisonto Experimental Crude Oil Separation Data. 2011, J. Disp. Sci. Techn.

9.3.3 Publications 2010

Nenningsland A, Simon S, Sjöblom J;
Surface properties of basic components extracted from petroleum crude oil, *(Energy and Fuels, 2010, 24, 6501–6505)*

Pamies R, Zhu K Z, Volden S, Kjøniksen A-L, Karlsson G, Glomm W R, Nyström B;
Temperature-Induced Flocculation of Gold Particles with an Adsorbed Thermoresponsive Cationic Copolymer. *(J. Phys. Chem. C, 2010, 114 (50), 21960-21968)*

Pamies R, Volden S, Kjøniksen A-L, Zhu K Z, Glomm W R, Nyström B;
Adsorption of Cationic Hydroxyethylcellulose Derivatives onto Planar and Curved Gold Surfaces. *(Langmuir, 2010, 26 (20), 15925-15932)*

Lesaint C, Spets Ø, Glomm W R, Simon S, Sjöblom J;
Dielectric response as a function of viscosity for two crude oils with different conductivities. *(Colloids and Surfaces A, 2010, 369 (1-3), 20-26)*

Grimes B A, Dorao C A, Simon S, Nordgård E L, Sjöblom J;
Analysis of dynamic surfactant mass transfer and its relationship to the transient stabilization of coalescing liquid–liquid dispersions. *(J. Colloid Interface Sci., 2010, 348, 479-490)*

Fan Y, Simon S, Sjöblom J;
Interfacial shear rheology of asphaltenes at oil-water interface and its relation to emulsion stability: influence of concentration, solvent aromaticity and nonionic surfactant. *(Colloids and Surfaces A, 2010, 366, 120-128)*

Fan Y, Simon S, Sjöblom J;
Influence of nonionic surfactants on the surface and interfacial film properties of asphaltenes investigated by Langmuir balance and Brewster angle microscopy. (Langmuir, 2010, 26, 10497-10505)

Farooq U;
Characterization of Crude Oil-Water and Solid-Water Interfaces and Adsorption/Desorption Properties of Crude Oil Fractions. *(Ph.D. Thesis 2010)*

Sjöblom J, Øvrevoll B, Jentoft G H, Lesaint C, Palermo T, Sinquin A, Gateau P, Barre L, Subramanian S, Boxall J, Davies S, Dieker L, Greaves D, Lachance J, Rensing P, Miller K, Sloan E D, Koh C A;
Investigation of the Hydrate Plugging and Non-Plugging Properties of Oils. *(J. Dispersion Sci. Technol., 2010, 31 (8), 1100-1119)*

Kelesoglu S;
Flow Behaviour of Water-in-North Sea Acidic Crude Oil Emulsions and Preparation of Synthetic Reference Acidic Oils and Their Emulsions. *(Ph.D. Thesis 2010)*

Amiri, A;
Rheology of silica-based dispersions abd Cross-sectional modeling of settling slurries. *(Ph.D. Thesis 2010)*

Sundman O, Simon S, Nordgård E L, Sjöblom J;
Study of the aqueous chemical interactions between a synthetic tetraacid and divalent cations as model for formation of metal naphthenate deposits. *(Energy and Fuels, 2010, 24, 6054–6060)*

Halskau Ø, Volden S, Calvo A C, Martinez A, Glomm W R;
Stabilization and bioactivity of tyrosine hydroxylase on gold surfaces and nanoparticles. *(Protein and Peptide Letters, 2010, 17 (11), 1376-1382)*

Yasuda M, Goda T, Ogino H, Glomm W R, Takayanagi H;
Preparation of Uniform Monomer Droplets Using Packed Column and Continuous Polymerization in Tube Reactor. *(J. Colloid Interface Science, 2010, 349 (1), 392-401)*

Yasuda M, Okamoto M, Sugimoto K, Glomm W R, Ogino H, Ishimi K, Ishikawa H;
Kinetics of Solution Polymerization and Seed Polymerization of 2-[p-(1,1,3,3-Tetramethyl- Butyl)

Phenoxy-Polyethoxy] Ethyl Methacrylate Macromonomers. *(J. Chem. Eng. of Japan, 2010, 43 (9), 767-776)*

Gawel B, Gawel K, Øye G;
Sol-Gel Synthesis of Non-Silica Monolithic Materials. *(Materials, 2010, 3, 2815-2833)*

Simon S, Theiler S, Knudsen A, Øye G, Sjöblom J;
Rheological properties of particle-stabilised emulsions. *(J. Dispersion Sci. Technol, 2010, 31, 136-143)*

Yasuda M, Kunieda H, Fujiwara M, Takenaka H, Glomm W R, Ogino H, Ishikawa H;
Kinetics of polymerizable azo initiator, 2,2'-Azobis[N-(2-propenyl)-2-methylpropionamide] and its application to graft copolymerization. *(J. Applied Polymer Sci., 2010, 118 (4), 2425-2433)*

Foss M, Gulbrandsen E, Sjöblom J;
Adsorption of Corrosion Inhibitors onto Iron Carbonate (FeCO3) Studied by Zeta Potential Measurements. *(J. Dispersion Sci. Technol, 2010, 31 (2), 200-208)*

Foss M, Gulbrandsen E, Sjöblom J;
Measurements of Zeta Potential on Corroding, High-Purity Iron Particles: Influence of Corrosion Inhibitors. *(J. Dispersion Sci. technol., 2010, 31 (2), 233-240)*

Less S, Hannisdal A, Sjöblom J;
Dehydration Efficiency of Water-in-Crude Oil Emulsions in Alternating Current Electrical Fields. *(J. Dispersion Sci. Technol., 2010, 31 (3), 265-272)*

Silset A, Flåten G R, Helness H, Melin E, Øye G, Sjöblom J;
A Multivariate Analysis on the Influence of Indigenous Crude Oil Components on the Quality of Produced Water. Comparison Between Bench and Rig Scale Experiments. *(J. Dispersion Sci. Technol., 2010, 31 (3), 392-408)*

Silset A, Hannisdal A, Hemmingsen P V, Sjöblom J;
Emulsions of Heavy Crude Oils. II. Viscous Responses and Their Influence on Emulsion Stability Measurements. *(J. Dispersion Sci. Technol., 2010, 31 (10), 1432-1445)*

Simon S, Nenningsland A L, Herschbach E, Sjöblom J;
Extraction of Basic Components from Petroleum Crude Oil. *(Energy&Fuels, 2010, 24, 1043-1050)*
Foss M, Gulbrandsen E, Sjöblom J;
Oil Wetting and Carbon Dioxide Corrosion Inhibition of Carbon Steel with Ferric Corrosion Products Deposits. *(Corrosion, 2010, 66 (2), Article Number: 025005)*

Nordgård, E.L., Sørland, G., Sjöblom, J.
Behavior of Asphaltene Model Compounds at W/O Interfaces. *(Langmuir, 2010, 26 (4), 2352-2360)*

Nordgård E L, Hanneseth A-M D, Sjöblom J;
Inhibition of Calcium Naphthenate. Experimental Methods to Study the Effect of Commercially Available Naphthenate Inhibitors. *(J. Dispersion Sci. Technol., 2010, 31 (5), 668-675)*

Sundman O, Nordgård E L, Grimes B, Sjöblom J;
Potentiometric Titrations of Five Synthetic Tetraacids as Models for Indigenous C-80 Tetraacids. *(Langmuir, 2010, 26 (3), 1619-1629)*

Volden S, Kjøniksen A-L, Zhu K, Genzer J, Nyström B, Glomm W R;
Temperature-Dependent Optical Properties of Gold Nanoparticles Coated with a Charged Diblock Copolymer and an Uncharged Triblock Copolymer. *(ACS Nano, 2010, 4 (2), 1187-1201)*

Trinh L T T, Volden S, Kjøniksen A-L, Zhu K, Knudsen K D, Glomm W R, Nyström B;
Temperature-induced adsorption and optical properties of an amphiphilic diblock copolymer adsorbed onto flat and curved silver surfaces. *(Journal of Colloid and Interface Science, 2010, 342 (1), 142-146)*

Opedal N V, Sørland G, Sjöblom J;
Emulsion Stability Studied by Nuclear Magnetic Resonance (NMR). *(Energy&Fuels, 2010, 24, 3628-3633)*

Hanneseth A-M D, Selsbak C, Sjöblom J;
Behavior and Stability of Naphthenic Acid/Naphthenate Stabilized Emulsions. Mixed C80-Tetraacid and Stearic Acid Stabilization. *(J. Dispersion Sci. technol, 2010, 31 (6), 770-779)*

Kralova I, Sjöblom J;
Biofuels – Renewable Energy Sources: A Review. *(J. Dispersion Sci. Technol., 2010, 31 (3), 409-425)*

9.3.4 Publications 2009

Amiri A, Øye G, Sjöblom J;
Influence of pH, high salinity and particle concentration on stability and rheological properties of aqueous suspensions of fumed silica. *(Colloids and Surfaces A, 2009, 349 (1-3), 43-54)*

Paso K, Kallevik H, Sjöblom J;
Measurement of Wax Appearance Temperature Using Near-Infrared (NIR) Scattering. *(Energy&Fuels, 2009, 23, 4988-4994)*

Fan Y R, Simon S, Sjöblom J;
Chemical Destabilization of Crude Oil Emulsions: Effect of Nonionic Surfactants as Emulsion Inhibitors. *(Energy&Fuels, 2009, 23, 4575-4583)*

Dudasova D, Flåten G R, Sjöblom J, Øye G;
Stability of binary and ternary model oil-field particle suspensions: A multivariate analysis approach. *(J. Colloid Interface Science, 2009, 337 (2), 464-471)*

Paso K, Kompalla T, Aske N, Rønningsen H P, Øye G, Sjöblom J;
Novel Surfaces with Applicability for Preventing Wax Deposition: A Review. *J. Dispersion Sci. Technol., 2009, 30 (6), 757-781)*

Nordgård E L, Magnusson H, Hanneseth A-M D, Sjöblom J;
Model compounds for C-80 isoprenoid tetraacids Part II. Interfacial reactions, physicochemical properties and comparison with indigenous tetraacids. *(Colloids and Surfaces A, 2009, 340 (1-3), 99-108)*

Vrålstad H Ø, Lesaint C., Spets Ø, Lundgaard L, Sjöblom J;
Dielectric Properties of Crude Oil Components. *(Energy&Fuels, 23, 5596-5602)*

Kunieda H, Hiramoto M, Glomm W R, Aizawa S, Yasuda M;
Effect of fibroblast cell which grew on amphiphilic polymer particle on the proliferation and differentiation of blood progenitor cell. *(J. Biosci. Bioeng., 2009, 108, S9-S10)*

Yasuda M, Nikaido H, Glomm W R, Ogino H, Ishimi K, Ishikawa H;
Enzyme immobilization on amphiphilic polymer particles having grafted polyionic polymer chains. *(Biochemical Engineering Journal, 2009, 48 (1), 6-12)*

Lesaint C, Glomm W R, Lundgaard L E, Sjöblom J;
Dehydration efficiency of AC electrical fields on water-in-model-oil emulsions. *(Colloids and Surfaces A, 2009, 352 (1-3), 63-69)*

Trinh L T T, Kjøniksen A-L, Zhu K, Knudsen K D, Volden S, Glomm W R, Nyström B.
Slow salt-induced aggregation of citrate-covered silver particles in aqueous solutions of cellulose derivatives. *(Colloid and Polymer Science, 2009, 287 (12), 1391-1404)*

Volden, S., Zhu, K., Nyström, B., Glomm, W.R.
Use of cellulose derivatives on gold surfaces for reduced nonspecific adsorption of immunoglobulin G. *(Colloids and Surfaces B: Biointerfaces, 2009, 72 (2), 266-271)*

Sjöblom J, Hemmingsen P V, Kallevik H;
The Role of Asphaltenes in Stabilizing Water-In-Crude Oil Emulsions. *("Asphaltenes, Heavy Oils and Petroleomics", O.C. Mullins, Editor, In Press)*

Chytil S, Glomm W R, Blekkan E A;
Characterization of Pt/SBA-15 prepared by the deposition–precipitation method. *(Catalysis Today, 2009, 147 (3-4), 217-223)*

Nordgård E L;
Model Compounds for Heavy Crude Oil Components and Tetrameric Acids. Characterization and Interfacial Behaviour. *(Ph.D. Dissertation 2009)*

Kralova I, Sjöblom J;
Surfactants Used in Food Industry: A Review. *(J. Dispersion Sci. Technol., 2009, 30 (8), 1363-1383)*

Volden S, Moen A R, Glomm W R, Anthonsen T, Sjöblom J;
Immobilization of Lipases from *Candida antarctica*. Influence of Surface Polarity on Adsorption and Transesterification Activity. *(J. Dispersion Sci. Technol., 2009, 30 (6), 865-872)*

Kumar M S, Hammer N, Rønning M, Holmen A, Chen D, Walmsley J C, Øye G;
The nature of active chromium species in Cr-catalysts for dehydrogenation of propane: New insights by a comprehensive spectroscopic study. *(J. Catalysis, 2009, 261 (1), 116-128)*

Pauchard V, Sjöblom J, Kokal S, Bouriat P, Dicharry C, Muller H, al-Hajji A;
Role of Naphthenic Acids in Emulsion Tightness for a Low-Total-Acid-Number (TAN)/High-Asphaltenes Oil. *(Energy&Fuels, 2009, 23, 1269-1279)*

Glomm W R, Volden S, Halskau Ø, Ese M-H G;
Same System-Different Results: The Importance of Protein. Introduction Protocols in Langmuir-Monolayer Studies of Lipid-Protein Interactions. *(Analytical Chemistry, 2009, 81 (8), 3042-3050)*

Friberg S E, Sjöblom J;
A Lyotropic Liquid Crystal with CaCl2,6H2O as the Polar Solvent. *(J. Dispersion Sci. Technol., 2009, 30 (5), 587-588)*

Sjöblom J;
Study on dissolution rate enhancement of poorly water soluble drug: contributions of solubility enhancement and relatively low micelle diffusivity. *(J. Dispersion Sci. Technol., 2009, 30 (5), 737-737)*

Park I, Efimenko K, Sjöblom J, Genzer J;
Rapid removal of organics and oil spills from waters using silicone rubber "sponges". *(J. Dispersion Sci. Technol, 2009, 30 (3), 318-327)*

Dudasova D, Flåten G R, Sjöblom J, Øye G;
Study of asphaltene adsorption onto different minerals and clays. Part 2: Particle characterization and suspension stability. *(Colloids and Surfaces A: Physicochemical and Engineering Aspects, 2009, 335 (1-3), 62-72)*

Lesaint C, Kleppa G, Arla D, Glomm W R, Øye G;
Synthesis and Characterization of Mesoporous Alumina Materials with Large Pore Size Prepared by a Double Hydrolysis Route. *(Microporous and Mesoporous Materials, 2009, 119 (1-3), 245-251)*

Paso K, Kompalla T, Oschmann H, Sjöblom J; Rheological Degradation of Model Wax-Oil Gels. *(J. Dispersion Sci. Technol., 2009, 30 (4), 472-480)*

Paso K, Silset A, Søland G, Goncalves M, Sjöblom J; Characterization of the Formation, Flowability, and Resolution of Brazilian Crude Oil Emulsions. *(Energy and Fuels, 2009, 23 (1), 471-480)*

Tierney S, Volden S, Stokke B T; A glucose sensor based on a responsive gel incorporated as a Fabry-Perot cavity on a fiber-optic readout platform. *(Biosensors and Bioelectronics, 2009, 24 (7), 2034-2039)*

Foss M; The Effect of Oil on Carbon Dioxide Corrosion Inhibition on Carbon Steel - Potential for Improved Corrosion Protection. *(Ph.D. Dissertation 2009)*

Hanneseth, A-M D; An Experimental Study of Tetrameric Naphthenic Acids at w/o Interfaces. *(Ph.D. Dissertation 2009)*

Foss M, Gulbrandsen E, Sjöblom J; Effect of Corrosion Inhibitors and Oil on Carbon Dioxide Corrosion and Wetting of Carbon Steel with Ferrous Carbonate Deposits. *(Corrosion, 2009, 65 (1), 3-14)*

9.3.5 Publications 2000-2009

A complete list of publications is available on the Ugelstad web-site:
http://www.chemeng.ntnu.no/research/polymer/ugelstadlab/

9.3.6 Ph.D. Theses

Nenningsland, Andreas Lyng
Extracton, Quantification and Study of Interfacially Active Petroleum Components.
Date of Defense: 17 December 2012

Klodian Xhanari
Nanosized cellulose fibrils as stabilizers of emulsions
Date of Defense: 28 January 2011

Nils van der Tuuk Opedal
NMR as a tool to follow destabilization of water-in-oil emulsions
Date of Defense: 30 September 2011

Serkan Keleşoğlu
Flow Behavior of Water-in-North Sea Acidic Crude Emulsions and Preparation of Synthetic Reference Acidic Oils and Their Emulsions
Date of Defense: December 20th 2010

Asal Amiri
Rheology of silica-based disperisons and Cross-sectional modeling of settling Slurries
Date of Defense: October 7th 2010

Umer Farooq
Dymamic simulation on a thermodynamic conoical basis
Date of Defense: September 30th 2010

Erland Nordgård
Model Compounds for Heavy Crude Oil Components and Tetrameric Acids. Characterization and Interfacial Behaviour
Date of Defense: September 7th 2009

Martin Smestad Foss
The Effect of Oil on Carbon Dioxide Corrosion Inhibition on Carbon Steel - Potential for Improved Corrosion Protection
Date of Defense: January 30th 2009

Ann-Mari Dahl Hanneseth
An Experimental Study of Tetrameric Naphthenic Acids at w/o Interfaces
Date of Defense: January 23rd 2009

Anne Silset
Emulsions (w/o and o/w) of Heavy Crude Oils. characterization, Stabilization, Destabilization and Produced Water Quality
Date of Defense: November 13th 2008.

Dorota Dudasova
Characterization of solid particle suspensions with organic coatings in oilfield produced water
Date of Defense: September 19th 2008.

Simone Less
Mechanisms of water-in-crude oil emulsion formation, stabilization and resolution by electrostatic means
Date of defense: June 25th 2008.

Ingvild A. Johnsen
The impact of dissolved hemicelluloses on adsorption of wood resin to TMP fines.
Date of Defense: October 12th 2007

Martin Andresen
Surface Modification of Microfibrillated Cellulose.
Date of Defense: August 31st 2007

Martin Fossen
Aggregation, Interfacial Properties and Structural Characteristics of Asphaltene Solubility Fractions.
Date of Defense: August 28th 2007

Sondre Volden
Preparation and Characteristics of Novel Silica-Based Materials and Adsorbed Macromolecules.
Date of Defense: December 19th 2006

Shukun Chen
Rheological Properties of Water in Oil Emulsions and Particulate Suspensions.
Date of Defense: October 6th 2006

Andreas Hannisdal
Particle-Stabilized Emulsions and Heavy Crude Oils. Characterization, Stability Mechanisms and Interfacial Properties.
Date of Defense: June 15th 2006

Torbjørn Vrålstad
Synthesis and characterization of cobalt-containing mesoporous model catalysts.
Date of Defense: December 2nd 2005

Øystein Brandal
Interfacial (o/w) Properties of Naphthenic Acids and Metal Naphthenates, Naphthenic Acid Characterization and Metal Naphthenate Inhibition.
Date of Defense: June 29th 2005

Magne Kawai Knag
Surfactant Aggregation in Solution and on Metal Surfaces and the Impact on Corrosion Rate.
Date of Defense: June 23rd 2005

Wilhelm Robert Glomm
Preparation and Characterization of Nanosized Structures with Applications in Bioscience and Materials
Date of Defense: June 23rd 2004

Trond Erik Havre
Formation of Calcium Naphtenate in Water/Oil Systems, Naphtenic Acid Chemistry and Emulsion Stability
Date of Defense: November 28th 2002

Narve Aske
Characterization of Crude Oil Components, Asphaltene Aggregation and Emulsion Stability by means of Near Infrared Spectroscopy and Multivariate Analysis
Date of Defense: September 23rd 2002

Inge Harald Auflem
Influence of Asphaltene Aggregation and Pressure on Crude Oil Emulsion Stability
Date of Defense: August 15th 2002

9.3.7 M. Sc. (Diploma) Theses

Ali, Hassan
Cloud Pint Depressants, Completed summer 2012

Bandyopadhyay, Sulalit
Biodegradable Nano-Clusters as drug delivery vehicles, Completed summper 2012

Lesaint, Caterina
Interfacial characterisation of dispersed components in produced water, Completed summer 2012

Naveed Asif
Adsorption/Desorption studies to Enhanced Oil Recovery, Completed summer 2010

Bicheng Gao
Characterisation and Rheological Properties of Model Gas hydrate particles, Completed summer 2010

Carl Marius Roel
Corrosive sulfur in transformer oils, Completed summer 2010

Xuan-Anh Ton
Synthesis and Characterization of Sol-Gel Derived Organic/Inorganic Hybrid, Completed summer 2010

Jordi Piella Bagaria
Protein-nanoparticle contructs for intracellular delivery, Completed fall 2010

Jo Aaserud
Alternative systems for wood preservation, Completede fall 2009

Andreas L. Nenningsland
Extraction and characterization of bases present in crude oil, Completed summer 2009

Håvard Foss Gran
Aqueos solubility of ARN acids and the effect of pH and counter ion valency, Completed summer 2009

Martin Håkon Aulie
Stability of SiC suspensions, Compledted summer 2009

Nils Opedal
Synthesis of metallic nano structures, Completed summer 2008

Kristin Aarhoug
Characterization of oil in produced water, Completed summer 2008

Øyvind Spets
Crude oil properties: Relation between viscosity and conductivity, Completed summer 2008

Marianne Lie
Advanced characterization of particles in produced water, Completed summer 2008

Agnethe Knudsen
Synthesis, Characterization and Applications of Nano structured Gamma Alumina, Completed summer 2008

Gøril Kleppa
Synthesis and Characterization of Nanostructured Alumina Materials, Completed summer 2008

Bjarne Braathen
Wax deposition in crude oil systems, Completed summer 2008

Lars Erik Noreng
Particle interactions at liquid-gas surfaces and adsorption onto particles in bulk solutions, Completed summer 2007

Gunn Heidi Jentoft
Adsorpstion of indigenous crude oil components on the model surfaces for gas hydrates, as studied by QCM, Completed summer 2007

Christian Melby Bjørn
Water-in-Crude oil emulsions characterized under flowing conditions, Completed summer 2007

Thomas Kompalla
En kombinert QCM-APM-studie av voksavsetninger på metalloverflater, (English: A combined QCM-APM-study of waxdepositions on metallic sufaces) Completed summer 2007

Kristin S. Haugbråten
En multivariate tilnærmelse til vann i olje emulsjonen stabilitet og destabilitet, (English: A multivariate approach to water in oil emulsion, stabillity and destability) Completed summer 2007

Katrine Næsland
Tolking av emulsjon separasjonsdata, (English: Interpretation of Emulsion Separation Data) Completed summer 2006

Camilla Lundberg
Effekt av Adsorpsjon av Ulike Typer Lignosulfonater på Viskositet av Sementpasta, (English: Effect of Adsorption of Various Types of Lignosulphonates on the Viscosity of Cement Paste) Compl. summer 2005

Hanne Pettersen
Transport av Gasshydrater i Olje, Effekt av Polar Råoljefraksjon, (English: Transport of Gas Hydrates in Oil, Effect of Polar Crude Oil Fractions) Completed June 2005

Ahmed Hersi
Treatment of Produced Water, Completed June 2005

Borja Fernandez de Arlas Bidegain
Formation of Functional Nanostructures from Macromolecular templates, Completed May 2005

Maren Larsson
Skumproblemer i Betong Tilsatt Polymerbaserte Additiver, (English: Foam Problems in Concrete caused by Polymer Based Additives) Completed November 2004

Martin Fossen
Opprettelse av Polaritetsindekser for Polare Makromolekyler i Råolje, (English: Establishment of Polarity Indices for Polar Macromolecules in Crude Oils) Completed June 2004

Ann-Mari Dahl Hanneseth
Grenseflatereaksjoner mellom Naftensyrer og Multivalente Kationer, (English: Interfacial Reactions between naphtenic Acids and Multivalent Cations) Completed June 2004

Anne Silset
Studie av Sammenhengen mellom Viskositet og Emulsjonsstabilitet for Råoljer, (English: Study of the Relationship between Viscosity and Emulsion Stability in Crude Oils) Completed June 2004

Kristin Gjerstad Jakobsen
Evaluation study of compact electrostatic coalescer systems for separation of heavy crude oil emulsions, Completed July 2004

9.3.8 Patents

Sjöblom J., Kallevik H., Westvik A., Auflem I.H. Process for separation of oil, water, and gas in a separator by breaking of water-in-oil emulsions. PCT Int. Appl. (2002), 22 pp. CODEN: PIXXD2 WO 0266137 A1 20020829

Annual Report for Ugelstad Laboratory 2012

The Ugelstad Laboratory was founded at the Norwegian University of Science and Technology (NTNU) in January 2002 to commemorate the late Professor John Ugelstad.

The laboratory specialises in surfactant chemistry and its technical applications, emulsions and emulsion technology, preparation of polymers and polymer particles and their technical applications, plasma chemical modification of surfaces and silica-based chemistry.

Applications include crude oil production and processing, pulp and paper, biomedicine, catalysis and materials science.

The main purpose is to raise the national level of colloidal science.

Edited by: Tom Helmersen and May Grete Sætran

http://www.ntnu.edu/chemeng/ugelstadlab

Svanemerket trykksak fra Skipnes Kommunikasjon / Lisensnr. 241 731

NTNU – Trondheim
Norwegian University of
Science and Technology