

Newsletter Q3/17

Autumn has arrived and the third quarter of 2017 is history. This summer, eleven students have been working with interesting topics for the SFI Metal Production. These students have made posters of their work that will be presented at the SFI Autumn meeting in November. We are looking forward to learning more about their work!

This August and September has been more busy than usual due to application deadlines at both Horizon 2020 and The Research Council of Norway. NTNU, SINTEF and some of the Industry Partners in SFI Metal Production were involved in the applications.

The 8th PROSIN Conference 2017 was arranged on the 15th of August in Arendal. The topic of choice this year was Circular Economy. The conference gathered a wide mix of industry, researchers and decision makers to highlight the possibilities and risks associated with the circular economy. One of the professors from the SFI, Daniel B. Müller had a very interesting presentation with the title; "Mapping metals and material cycles on a global scale - Insights for circular economy". The presentation is available on the internet.

NTNU (Rector's office) arranged a Workshop on Indicators for Innovations with participants from the SFIs at NTNU. The topic is very relevant for SFI Metal Production as we are in the process of defining Innovations that has the potential of being applied in the industry.

In August, the SFI arranged a HSC Chemistry course with more than 20 participants and in September, the Si/FeSi fundamental course and a Stakeholders meeting for EiT Raw Materials were arranged.

The SFI Metal Production has many interesting activities remaining the calendar this autumn. As usual, we are now in the process of making Work Plans for 2018 that will be presented for approval on the General Assembly meeting in November. The Work Plan is now being discussed with all the research and industry partners.

We will also make a Progress Report summing up the work and deliverables carried out in 2017 to the Research Council of Norway. A course for registration of publications in the CRISTin database will be arranged on the 11th of October. The course is mandatory for students and researchers that are a part of the SFI. The aim is to ensure that all publication will be registered and credited to the SFI.

As you can see in Upcoming Events on page 5, the last quarter of 2017 also involves courses, seminars and meetings. We hope to see you at one or several of these activities!



INSIDE THIS ISSUE

Summer Students	2
HSC Chemistry Course	3
EU-Applications.....	4
EiT RawMaterials	4
New PhD in RD5.....	4
Upcoming Events.....	5

SPECIAL POINTS OF INTEREST

- New Executive Committee Leader
- Elkems Innovation Prize



New Leader of the Executive Committee

Tor Grande, Vice Dean for Research at the Faculty of Natural Sciences at NTNU, has been elected as the new leader of the Executive Committee and he is also NTNU's member in the SFI General Assembly. He has an MSc in Chemistry (1987) and a PhD in Inorganic Chemistry (1992) from NTH, became a professor in Materials Chemistry/ Science at the Department of Materials Science and Engineering in 1997 and has since been appointed to a number of management positions.

We look forward to the co-operation!

Executive Committee

Tor Grande, NTNU (Leader)

Nancy Holt, Hydro

Ketil Rye, Alcoa

Leif Hunsbedt, Eramet

Ragnar Tronstad, Elkem

Eli Aamot, SINTEF

Svenn Anton Halvorsen, Teknova

Tor Einar Johnsen, NFR

Summer Students 2017

This summer there were 11 students, who had just finished the 2nd, 3rd or 4th year of their integrated masters program, working for the SFI. The projects these students worked on this summer mostly concerned different aspects of aluminum production, but a few were also silicon related. Some of the now 5th grade students have continued their work after summer as project assignments, and will possibly also write master theses about these topics.

For most of the students, it was their first time working for the Department of Materials Science and Engineering, SFI Metal Production or an industrial partner; an excellent opportunity to learn first hand how engineers and scientist work, and even get to work alongside them.

Emil Grove Dyrvik

Alumina powder is used in aluminum production, and in his project Emil looked into how it behaves when heated rapidly. He studied the loss of humidity on ignition, at which temperatures it occurs, to establish how much it affects alumina dissolution properties. He was also looking at the kinetics of phase transformations using XRD analysis.

Trygve Storm Aarnæs

Beryllium is traditionally used to prevent oxidation of liquid aluminium-magnesium alloys, but it poses significant health risks in production and it is therefore important to find alternatives. Trygve was working with PhD Nicholas Smith on the effect of different elements on alloy oxidation, reacting different samples at a variety of temperatures and time intervals.

Turid Danbolt

Turid was working on a project for Kavli and Hydro. She was trying to find a simple way to recycle aluminum from food packaging. This is problematic as it can be over 50% food leftovers and plastic in these materials. The work included both laboratory work in Trondheim and industrial trials in Holmestrand.

Eirik André Nordbø

There are many off-gases that come from aluminum production, and they will produce an unfortunate deposit called grey scale in the exhaust pipes. Eirik monitored the heat exchange in these pipes using flux sensors and also looked at grey scale using SEM. The project was in cooperation with Hydro Sunndalsøra, and the goal was to learn more about how it is possible to decrease the grey scale deposit.

Ingrid Meling

Ingrid was studying the fluxing of oxide films on recycled aluminium using different types of salts. She looked at how well the metal coagulates, both when it is lacquered and when it is not, and then analyzed the coating layer using optical microscopes and SEM.

Mona Haukali

Mona received samples from an excavation of a SiMn furnace, and her task was to analyze the samples using SEM. They came from 17 different areas in the furnace, and her job was to find out which phases exist where.



Cathrine Kyung Won Solem

To improve the purity of recycled aluminium, it is common to use Ceramic Foam Filters. However, there is need for more knowledge about this technique to improve the process further. Cathrine was studying the wetting angle of aluminium on different filter materials under different pressures.

Dagny Aspaas Myrhaug

Dagny was also working on the filtration project, but she was looking into the density of the filters. To do that, she was using software to help her examine the amount of pores and their diameter.

Ploy Chutigan

During the silicon production process there will always be silicon carbide formed. PhD candidate Sethulaksmi Jayakumari is looking at the formation of this SiC, and Ploy was running experiments for her. She was making silicon using a variation in carbon sources before analyzing the samples using SEM.

Sigvart Hansen Eggen

Sigvart was working for Alcoa in Mosjøen where he was looking at spent pot-lining (SPL), a waste product from the aluminum industry, and examined the possibilities for even more recycling than is being done today.

Sindre Engzeliuss Gylver

In the Hall-Heroult process, cryolite is used to dissolve alumina. Sometimes during the dissolution, process fleets are formed. Sindre was working for Alcoa in Mosjøen looking at this fleet formation trying to understand why it happens.

HSC Chemistry Course

A HSC Chemistry course was held in Trondheim on the 29th and 30th of August, where the main focus was to get started with HSC in general and using HSC version 9 in particular. Matti Hietala from Outotec presented the new features of HSC and was specially focusing on the Simulation model.

HSC Chemistry is a thermodynamic program which is useful for finding data and more applicable, very useful for mass and energy balances, including exergy analyses. Compared to other programs, HSC Chemistry has a simple user-interface and can be used for quite advanced calculations without much introduction. More than 20 participated in the course, mainly from NTNU, SINTEF and Teknova.

The Research Domains

RD1 Fundamentals and modelling tools

Arne Petter Ratvik
Senior Research Scientist
SINTEF
arne.p.ratvik@sintef.no

RD2 Primary Metal Production

Merete Tangstad
Professor
NTNU
merete.tangstad@ntnu.no

RD3 Recycling and refining

Anne Kvithyld
Senior Research Scientist,
SINTEF
anne.kvithyld@sintef.no

RD4 Emissions and energy recovery

Gabriella Tranell
Professor
NTNU
gabriella.tranell@ntnu.no

RD5 Materials and Society

Leiv Kolbeinsen
Professor
NTNU
leiv.kolbeinsen@ntnu.no



Elkem Innovation Prize

Every year, Elkem's Research Fond appoints a winner of the Elkem innovation prize at the PROSIN conference, and this year the prize went to a project on Reduction of NOx Emissions.

Elkem Solar AS CEO Helge Aasen presented the award to NTNU professor Halvard Tveit, which represented the project.

In his acceptance speech he pointed out that lots of people had participated and thanked them all for their efforts.

The results are based on a patient and long-term work and wouldn't have been possible without support from NTNF, FFF, NTNU, Sintef and the Elkem core team Nils Eivind Kamfjord, Halvard Tveit, Edin Myrhaug, Håkon Delbeck and Geir Johan Andersen.

Congratulation!



4

Romain Billy

EU-Applications

From the metal production area, 2 second stage applications were sent to the H2020, SC5-14 Innovation action call with NTNU as coordinator:

SisAl –Silicon production with low environmental impact using secondary aluminium and silicon product streams. The project is aimed at demonstrating the viability of a new production process for silicon and silicon alloys. Other Norwegian partners included SINTEF, Hydro Al, and BNW Energy.

REEcovering - Recovery of Rare Earth Elements from magnetic waste in WEEE. The project is a value chain project from EoL electrical and electronic goods take-back schemes to magnet alloy, aimed at recovery of Rare Earth Elements.

In addition, the project **RemovAl**, with Aluminium of Greece as coordinator, was submitted. The project is aimed at valorization of Red Mud from alumina production. Norwegian partners include Elkem Research, NTNU and SINTEF.

EIT RawMaterials Stakeholders Meeting

On the 20th of September, NTNU organized an EIT RawMaterials Stakeholder Meeting with the purpose of informing industry and R&D organisations in Norway about the network. EIT RawMaterials is a European initiative to strengthen innovation and education in the raw material sector by supporting new talents and new ideas through Knowledge and Innovation Communities (KICs). In the existing network, 114 partners from 22 countries in Europe are represented. NTNU and ReSiTec have recently applied for membership and will be the first two organisations from Norway entering the network. For more information about EIT RawMaterials, please visit <https://eitrawmaterials.eu/>



New PhD Joining the Team

Romain Billy is a new PhD from France who will work in Research Domain 5 for the next four years. The exact title of his work is not yet determined, but he will study the material flows of aluminum on a global scale and model possible future changes, with a special focus on the adoption of new technologies in metallurgical processes.

Stock dynamics will be used for scenario development to forecast future stocks, flows of secondary material and primary resources use, and their consequences on environment and the economy. Interactive visualizations of the results will provide decision makers with a tool to understand the likely future evolution of the aluminium production system, and its sensitivity to changes in the scenario parameters. His supervisor Daniel Mueller and Research Domain leader Leiv Kolbeinsen will help him narrow down his area of focus.

Upcoming Events

2017

- October 3rd-4th** **Mn Fundamentals Course & RD2 Mn Meeting**
Trondheim, Norway
- October 11th - 12th** **Tapping Seminar**
Trondheim, Norway
- November 7th - 8th** **SFI Metal Production Autumn Meeting**
Trondheim, Norway
- November 8th** **Executive Committee Meeting**
Trondheim, Norway
- November 9th** **General Assembly Meeting**
Trondheim, Norway
- November 27th** **Dust/Fugitive Emissions, Workshop**
Trondheim, Norway
- November 28th** **Recycling Seminar**
Trondheim, Norway

SFI Metal Production

Metal Production is an interdisciplinary Centre for Research-based Innovation (SFI). During the next decades, the Norwegian metal industry will need to achieve even higher-quality output with more efficient use of resources and energy.

The main goal of the Metal Production is to enable industrial innovation and give the industry long term access to world class fundamental competence and candidates. This will enable the industry to maintain its position at the forefront of sustainable innovation.

Center Director



Aud Nina Wærnes
Senior business developer, SINTEF

Location: Alfred Getz' vei 2
Bergbygget E-306A
Cellphone: +47 93059428
E-mail: Aud.N.Warnes@sintef.no

SFI Metal Production

NTNU Gløshaugen
Alfred Getz' vei 2
NO-7491 Trondheim
Norway

<https://www.ntnu.edu/metpro>

Twitter
[@sfimetprod](https://twitter.com/sfimetprod)