

## SFI METAL PRODUCTION

### Newsletter No 3/19

2019 is coming to an end, and we would like to share some news with our partners in the SFI.

This autumn there have been some changes in the Centre management. Kristian Etienne Einarsrud has replaced Arne Petter Ratvik as leader of Research Domain 1 and Casper Van der Eijk has replaced Leiv Kolbeinsen as leader of RD 5. Marianne Lenes has been the Centre coordinator from the beginning in 2015. She moved on to other position at Department of Materials Science and Engineering in September this year and has been replaced by Kari Håland. I would like to thank Arne Petter, Leiv and Marianne for their important contributions to the startup and further development of SFI Metal production in the first Centre period.

The SFI progress report for 2019 to the Research Council shows that the Centre continues to produce important results and progress in the field of metal production. The plan from the beginning has been to recruit a total of 15 PhD candidates and 5 Postdocs during the Centre period. This autumn the last candidates were recruited, one Postdoctor and one PhD candidate. A very warm welcome to Shokouh Haghdani and Haley Hoover!

Several events, courses and seminars have been organized this autumn. SFI Autumn meeting was held November 5-6. We would like to thank all speakers and the audience for making this an interesting and successful meeting.

Thank you all SFI members for the collaboration throughout 2019. We are looking forward to continuing working together towards our common goals in 2020.

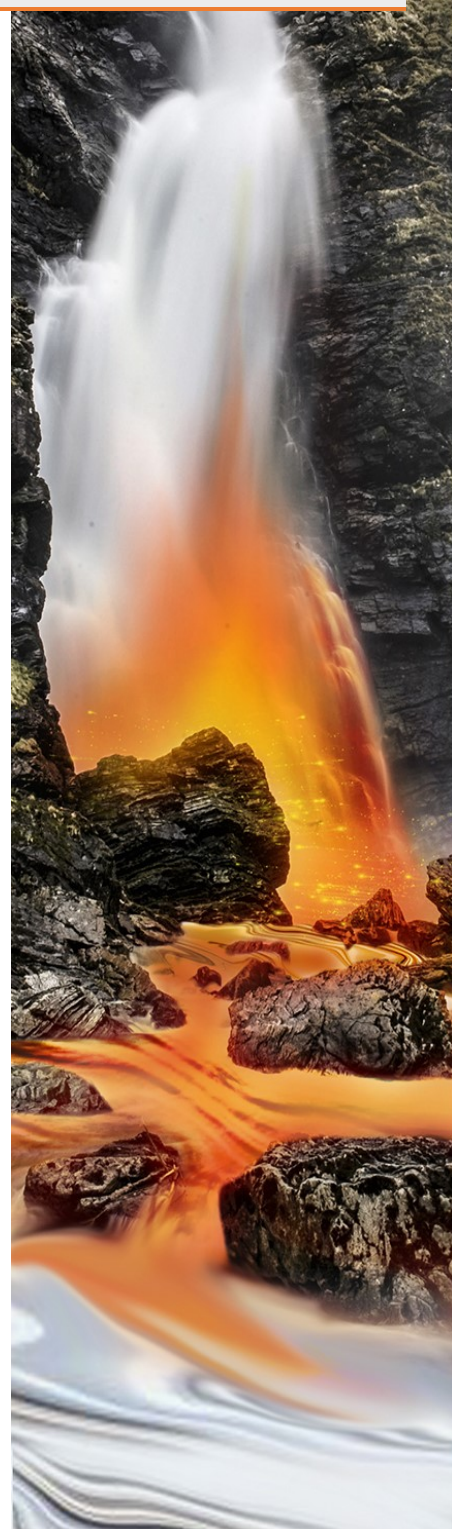
Aud N. Wærnes, Centre Director



**Merry Christmas & Happy New Year!**

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# SFI AUTUMN MEETING

November 5-6



The SFI Metal Production autumn meeting was held in Trondheim November 5-6. More than 70 participants from the SFI-partners attended the meeting. Participants from industry and academia enjoyed interesting lectures and discussions.

During the two-day meeting all research Domain leaders and some of the RD members gave an update on status and future plans for their research area. Two new technologies were presented: 1) The new furnace at Wacker, Kyrksæterøra and 2) Hydro Pilot at Karmøy

Maria Wallin told us about the funding possibilities in SPIRE and the coming new EU frame program «Horizon Europe».

8 postdoctors, PhD candidates and masterstudents had prepared poster presentations to the autumn meeting.



*Artur Kudyba, Sethu Jayakumari, Hossein Salehi and Haley Hoover in front of their posters.*

## Scientific Committee Meeting

The Scientific committee (SC) members were invited to the autumn meeting, and a separate SC meeting was organized the following day.

The four committee members are appointed as advisors to the centre, in order to secure that the centre activities hold an excellent scientific standard and that we are closely connected with leading scientific groups in metallurgy around the world.

*From left: SC members Jean-Pierre Birat and Margaret Hyland, SFI management Aud Wærnes and Gabriella Tranell. SC member Markus Reuter had left when the picture was taken and In-Ho Jung participated by Skype.*





# New EU project — SisAl Pilot coordinated by Gabriella Tranell



**SisAl Pilot coordinated by Gabriella Tranell was successfully funded by H2020 in the SC5-07a-2018-2019-2020 call - Sustainable processing and refining of primary and/or secondary raw materials call. The project is an innovative pilot for Silicon production with low environmental impact using secondary Aluminium and silicon raw materials.**

The project aims to demonstrate a patented novel industrial process to produce silicon (Si, a critical raw material), enabling a shift from today's carbothermic Submerged Arc Furnace (SAF) process to a far more environmentally and economically sustainable alternative: an aluminothermic reduction of quartz in slag that utilizes secondary raw materials such as aluminium (Al) EoL scrap and dross, as replacements for carbon reductants used today.

SisAl Pilot represents a path-breaking approach, and a strong contribution to “circularity” through industrial symbiosis where the Al industry will act as both a raw material supplier and end user to the Si industry. Across sectors, SisAl Pilot will give substantial reductions in material yield losses, enhanced valorisation of waste- and by-product streams, at a 3 X lower energy consumption and radically lower emissions of CO<sub>2</sub> and harmful pollutants, at a considerably lower cost.

Total budget: 14.5 MEuro, project length: 4 years, Partners:



# Workshop at Alcoa Mosjøen, December 5th



**A workshop on innovation research in the aluminum industry was organized at Alcoa, Mosjøen, December 5th.**

Alcoa is one of the SFI Metal Production industry partners. A delegation from NTNU and SINTEF visited Alcoa to discuss progress in ongoing research.



Visitors from Trondheim (NTNU and SINTEF) were researchers from the SFI Metal Production and the FME HighEFF. They presented recent results and future plans were discussed in groups with participants from all organizations.

Photo: Kari Håland

Alcoa was a dedicated host for the delegation from Trondheim. The seminar program also included a guided tour on the smelter site, highly appreciated in particular by participants visiting Alcoa for the first time. We are looking forward to continuing the collaboration and wish to thank Alcoa for receiving us and making the seminar a success.



# PhD Dissertation –Hamideh Kaffash

August 21 - Trondheim



*Hamideh giving her trial lecture, August 21, 2019*



*From left: Opponents Senior Lecturer Dr. Robert Cromarty and Professor Haijuan Wang, Hamideh and her supervisor Merete Tangstad*

PhD candidate Hamideh Kaffash successfully defended her Doctoral Thesis in August. Professor Merete Tangstad has been the candidate's supervisor. Hamideh did an excellent presentation in her public trial lecture "Production of Mn sinter in the Mn-process" followed by a presentation of her PhD thesis "Dissolution kinetics of carbon materials in FeMn". The Assessment Committee has been Professor Haijuan Wang, University of Science and Technology Beijing, China, Senior Lecturer Dr. Robert Cromarty, University of Pretoria, Materials Science and Metallurgical Engineering, South Africa and Professor Gabriella Tranell, Department of Materials Science and Engineering, NTNU.

Hamideh is now working as Postdoctor at Department of Materials Science and Engineering. **Congratulations Hamideh!**

## Well attended Filtration Workshop with Pyrotek

November 25, 2019, Trondheim, Norway



*Inge Johansen (Hydro), JiaWei Yang (NTNU), Magnus Skramstad (NTNU), Ulrik Eriksen (NTNU), Anne Kvithyld (SINTEF), Steinar Benum (Hydro), Rich Henderson (Pyrotek), Ragnhild Elizabeth Aune (NTNU), Shahid Akhtar (Hydro), Britt Elin Gihleengen (Hycast), Egil Solberg (Alcoa), Jan Anders Saeter (Alcoa), Nicholas Smith-Hanssen (SINTEF), Are Bergin (Hydro/NTNU), Robert Fritzsche (Pyrotek/NTNU), Martin Syvertsen (SINTEF), Thorvald Abel Engh (NTNU), Sarina Bao (SINTEF). Photo: Sarina Bao*

Monday 25. November 2019 SFI Metal Production organised a half-day workshop with focus on filtration. Pyrotek's Director of Technology and responsible for Bonded Particle Cartridge Filter came all the way from US to speak and attend. The topics were in addition to cartridge filters, priming, and recent research and development. The workshop was attended by 5 Hydro representatives, 2 from Alcoa and 2 from Pyrotek in addition to the NTNU and SINTEF representatives.

# Christmas Workshop



## Origami and gingerbread houses!

December 10th Gabriella Tranell invited the SiManTi student group to the yearly Christmas workshop and Ginger-house decoration event. This is a nice event where new international members of the group can participate in Norwegian Christmas traditions together with the more established students. The main events this year was Christmas tree and 3D-snowflakes origami production as well as decorating gingerbread houses. We ended the workshop with pizza and beer (as we always do).



Photos: Merete Tangstad



# New SFI members

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## Haley Hoover - new PhD candidate at the centre from August



Haley Hoover started as a PhD candidate at the centre in August 2019. Haley's preliminary project title is "Resitivity of Partially Transformed Materials in the FeSi/Si Process", and Professor Merete Tangstad is her supervisor.

Haley got her master's degree in Sustainable Energy Science from Reykjavik University in May 2019. The aim of her project is to study the energy development in the furnace through ex-

aming the resistivity of the charge materials that are transformed as a function of temperature, size, and composition. As of now, the resistivity of these partially transformed materials is virtually unknown, so the project is expected to provide novel insight into the flow of energy throughout the furnace.

## Shokouh Haghdani- new Postdoctor at the centre from December

Shokouh Haghdani started as a Postdoctor at the Centre in December 2019. Shokouh's preliminary project title is "Influence of structure on slag viscosity", and Professor Kristian Etienne Einarsrud is her supervisor.

Shokouh got her PhD from the chemistry department at NTNU.

The project aims at developing thermodynamic viscosity models for slag systems. The models will be linked to the structure of slags using Raman spectroscopy that characterizes internal structures experimentally. In addition, a rotational viscometer will be employed for measuring viscosity (when applicable) to validate viscosity models. We would like to perform these steps for three industrial systems, namely Mn-, Ti- and Si-related slags.



*Welcome to SFI Metal Production!*

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## Important events next year

**February 23-27, 2020** TMS 2020 Annual Meeting & Exhibition. San Diego, California, USA

**April 20-24, 2020** Hydrometallurgy in raw materials utilization - a five-day comprehensive course (HydroMetEC), Trondheim, Gløshaugen PFI building.

**April 28-29, 2020** SFI Metal Production Spring Meeting. Programme and more information will follow. Trondheim Norway

**April 29-30 2020** elMet Meeting. Programme and more information will follow. Trondheim Norway

**June 9-11, 2020** 14th International Conference on Computational Fluid Dynamics In the Oil & Gas, Metallurgical and Process Industries. Trondheim, Norway. For more information see conference webpage.

**June 15-18, 2020** Silicon for the Chemical and Solar Industry Conference XV, Trondheim, Norway. For more information see conference webpage.

**July 19-24, 2020** 14th World Congress on Computational Mechanics (WCCM XIV) and 8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2020), Paris, France. For more information see conference webpage.

**August 3-7, 2020** Aluminium Summer School - Impact of Aluminium in a Circular Economy. The registration will be opened from January 15 - July 15, 2020. Trondheim, Norway. See Summer School website for more information: [www.ntnu.edu/ima/al2020](http://www.ntnu.edu/ima/al2020)



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### Executive Committee

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Nancy J. Holt, Hydro

Ketil Rye, Alcoa

Leif Hunsbedt, Eramet

Marit Dolmen, Elkem

Eli Aamot, SINTEF Industri

Svenn Anton Halvorsen, NORCE

Tor Einar Johnsen, NFR

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