

S. Erik Offerman

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Research interests:
Design, processing, and closing-the-loop of metals and alloys for a transition to a (more) resource-efficient and circular economy; Critical Materials; Substitution; Alloy development for recycling.

Metals and Sustainable Development

Research activities:

Design, processing, and closing-the-loop of metals and alloys are essential for a transition to a (more) resource-efficient and circular economy. Understanding the evolution of the microstructure during processing of steel opens the door to the development of resource-efficient steels. Instead of adding critical, toxic and/or expensive alloying elements to steel, we can tailor the microstructure to obtain the desired properties of steel with abundant alloying elements. Two projects related to this topic are:

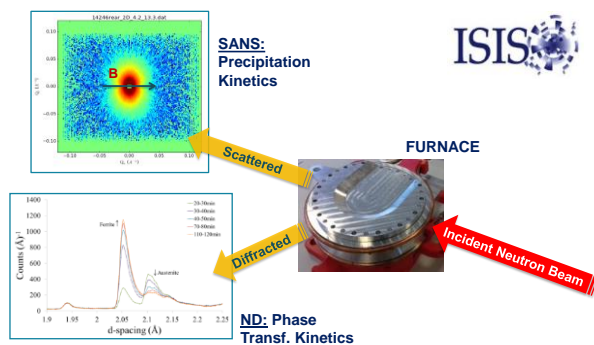
- Resource efficient NANO-steels through in-situ and simultaneous studies of the precipitation and phase transformation kinetics. Together with Chrysoula Ioannidou, Alfonso Navarro Lopez, Ad van Well, and Arjan Rijkenberg (Tata Steel).
- The role of silicon in strip steel. Together with Monika Krugla & Dave Hanlon (Tata Steel), and Jilt Sietsma.

Closing the metals loop together with Yongxiang Yang:

- we work on the recycling of zink-containing dust (waste) and scrap within Hlsarna-pilot plant at Tata Steel together with Tim Kerry, Evangelos Georgakopoulos and Ashkan Hosseini.
- we work on recovery of Cerium (Ce) from polishing powder waste and use Ce in a heat-resistant aluminium alloy together with Thijs Vlught and Chenna Borra.

Teaching activities:

- Responsible teacher for the course 'Materials Science and Engineering' (6 EC) for BSc-students (~500) in Mechanical Engineering.
- Responsible teacher 'Society's needs: case studies and material challenges' (3 EC) and 'Materials and Sustainable Development' (3 EC) for MSc-students for in MSE.
- Given a workshop about 'Digital Exams'.



In 2018 we successfully constructed and tested a furnace that is compatible with the Larmor-instrument for neutron scattering at ISIS (UK) and a 1.6 T magnet. We used the furnace for in-situ and simultaneous measurements of the interphase precipitation kinetics (via small-angle neutron scattering (SANS)) and the austenite-to-ferrite phase transformation kinetics (via neutron diffraction (ND)) in steel at 600 °C.

Key publications:

- [1] C.R. Borra, T.J.H. Vlught, Y. Yang and S.E. Offerman, Recovery of cerium from glass polishing waste: A critical review *Metals* 8(10), 801 (2018).
- [2] C. Ioannidou et al., VC-precipitation kinetics studied by Small-Angle Neutron Scattering in Nano-Steels, *Materials Science Forum*, Vol. 941 (2018), pp 236-244.

Other Achievements/roles:

- [1] Editorial board member for Scientific Reports of Nature publishing group.
- [2] Editor of the book 'Critical Materials: underlying causes and sustainable mitigation strategies'
- [3] Board member of the Leiden-Delft-Erasmus Centre for Sustainability
- [4] Chairman Board of Studies & Education Committee of MSE
- [5] Chairman Department Council & MT of MSE.