

# Yongxiang Yang

Associate professor



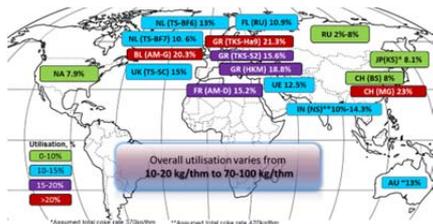
PhD, Helsinki University of Technology (1996)  
Tel: +31-15 2782542  
E-mail: y.yang@tudelft.nl  
Website: mse.tudelft.nl

Research interests:  
Metals extraction, refining and recycling; process modelling and simulation

## Metals Production, Refining and Recycling (MPRR)

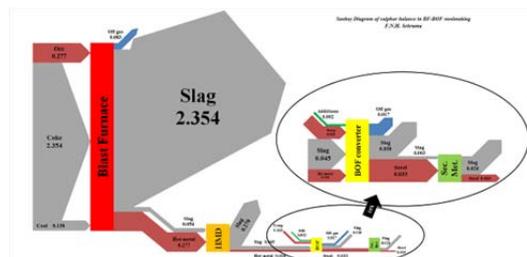
### RECENT RESEARCH ACTIVITIES

**Blast furnace ironmaking:** Shifting the limit of nut coke usage (*PhD, Dharm Jeet Gavel*)  
The aim of the research is to maximize the use of smaller sized cheaper coke and to increase the process efficiency if BF ironmaking.



As part of the literature survey, a global overview of nut-coke usage is made. Modification of the experimental apparatus (ASM: Advanced Softening and Melting Equipment) is under way.

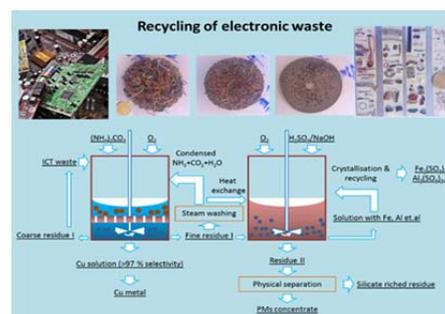
### Sulphur removal in ironmaking and steelmaking (*PhD, Frank Schrama*)



The first result shown above is the construction of sulphur flow from ironmaking to the end of steelmaking. This brings a clear picture about sources and destinations of "S" and the potential areas where "S" could be further removed.

### Recycling of electronic waste (*Dr. Zhi Sun*)

A closed-loop hydrometallurgical process for recovery of the strategic metals (Cu, Au and PGMs) from valuable e-waste streams has been developed (RESTMETAL). Partner company is up-scaling the process based on the flowsheet developed in the lab scale.



### Recycling of rare earth elements (*PhDs, Aida Abbasalizadeh, Prakash Venkatesan, Xiaoling Guo, Sebastiaan Peelman*)

2 EU FP7 funded projects (EREAN, REEcover) with 4 PhD students are developing different types of routes and technologies for recovery of REEs from NdFeB permanent magnet scrap and mine tailings. As a result 4 book chapters from each PhD students have been published in a recent Book on REES. Preliminary processing technologies are developed. Prakash focuses on electrochemical dissolution and solution purification of REEs from magnet scrap; Sebastiaan is developing hydrometallurgical technologies to recover REEs from apatite concentrates in iron ore mine tailings and WEEE scrap; Aida and Xiaoling are investigating more efficient method of molten salt electrolysis to recover REE metals and alloys from low grade REE oxides from e-scrap and mine tailings.

### KEY PUBLICATIONS

- Yingxia QU, Yongxiang YANG, Zongshu ZOU, Christiaan ZEILSTRA, Koen MEIJER and Rob BOOM. *ISIJ International* 55 (2015), 149–157; 55 (2015), 952–960. (2 separate papers)
- Z.H.I. Sun, Y. Xiao, J. Sietsma, H. Agterhuis, G. Visser, Y. Yang. *Waste Management* 35 (2015), 227-235.
- Z.H.I. Sun, Y. Xiao, J. Sietsma, H. Agterhuis, G. Visser, Y. Yang. *Hydrometallurgy* 152 (2015), 91-99.
- Z.H.I. Sun, Y. Xiao, J. Sietsma, H. Agterhuis, Y. Yang. A Cleaner Process for Selective Recovery of Valuable Metals from Electronic Waste of Complex Mixtures of End-of-Life Electronic Products. *Environ. Sci. Technol.* 49 (2015), 7981–798.
- Z. Sun, Y. Xiao, J. Sietsma, H. Agterhuis, Y. Yang. Recycling of metals from urban mines – a strategic evaluation. *Journal of Cleaner Production* 112 (2016), 2977-2987.