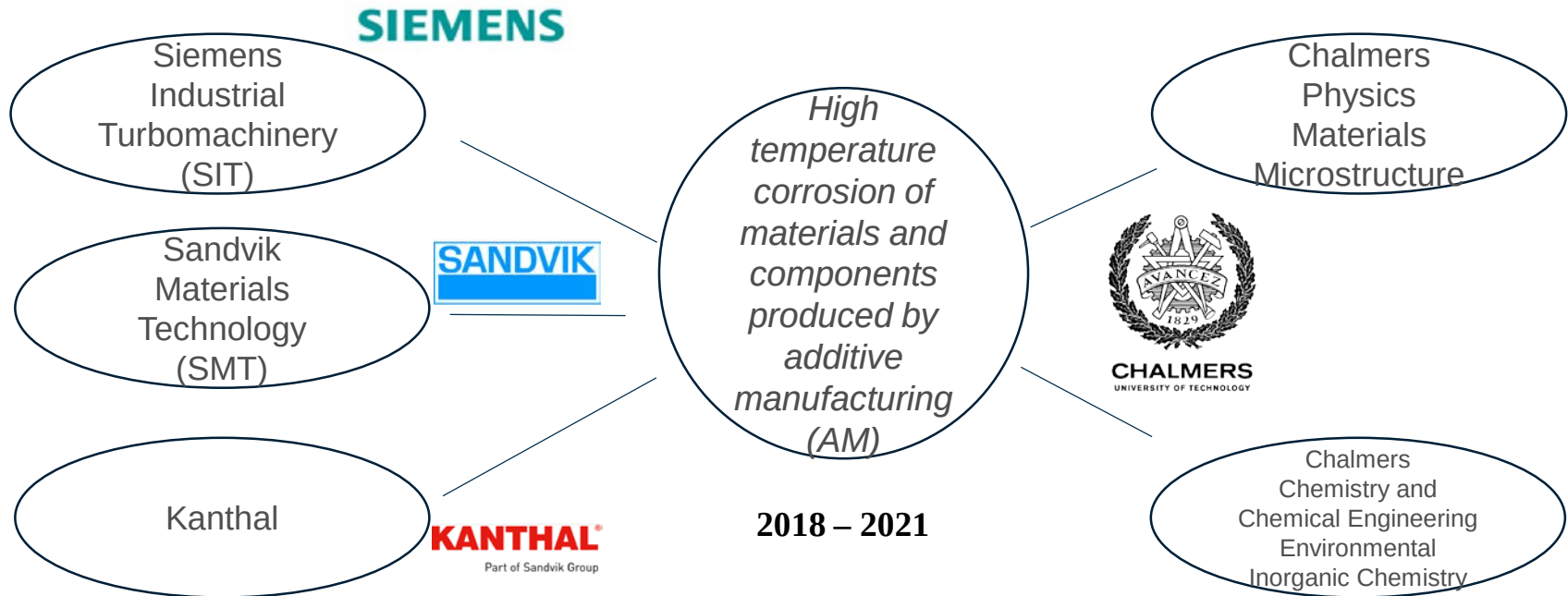


***HIGH TEMPERATURE CORROSION OF
MATERIALS AND COMPONENTS
PRODUCED BY ADDITIVE
MANUFACTURING (AM)***

MOHAMMAD SATTARI, MATS HALVARSSON

PARTICIPATING PARTNERS



PERSONEL INVOLVED

- Mats Halvarsson (project leader;Chalmers)
- Jan Froitzheim (Chalmers)
- Mohammad Sattari (Chalmers)
- Irina Fedorova (Chalmers)
- Özgür Gündüz (Chalmers)
- Marie-Aude Porter (SIT)
- Thomas Helander (Kanthal)
- Saud Saleem (Kanthal)
- Mats Hättestrand (SMT)

OVERALL AIMS

- generate new knowledge about how the specific microstructure caused by the AM process affects corrosion properties
- be able to manufacture novel, highly corrosion resistant materials by the AM method

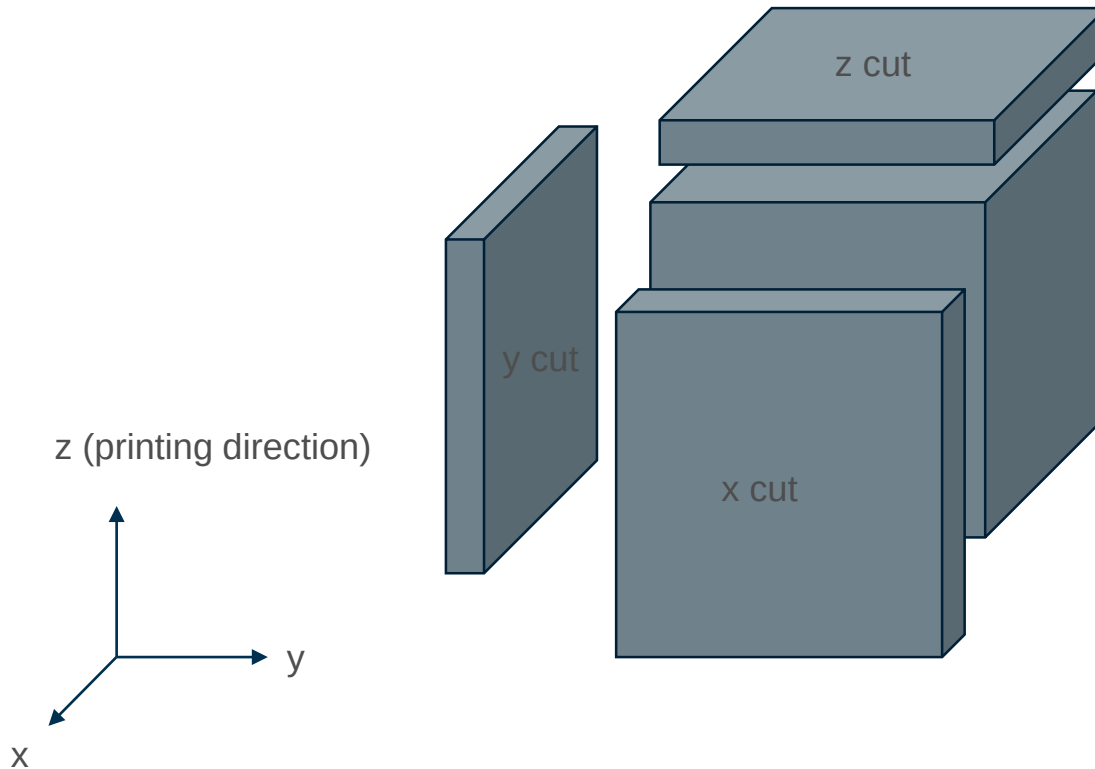
PROJECT GOALS

- Understand the differences and similarities between conventional and AM produced materials and the relation to the printing process
- Perform well-controlled laboratory oxidation testing in relevant environments
- Perform detailed microstructural investigations elucidating the microstructural changes in the material and the oxide scale formation
- Correlate the findings in order to describe the corrosion processes
- Build a fundamental understanding of the corrosion performance of AM produced materials, enabling fabrication of tailor-made materials for demanding high temperature applications

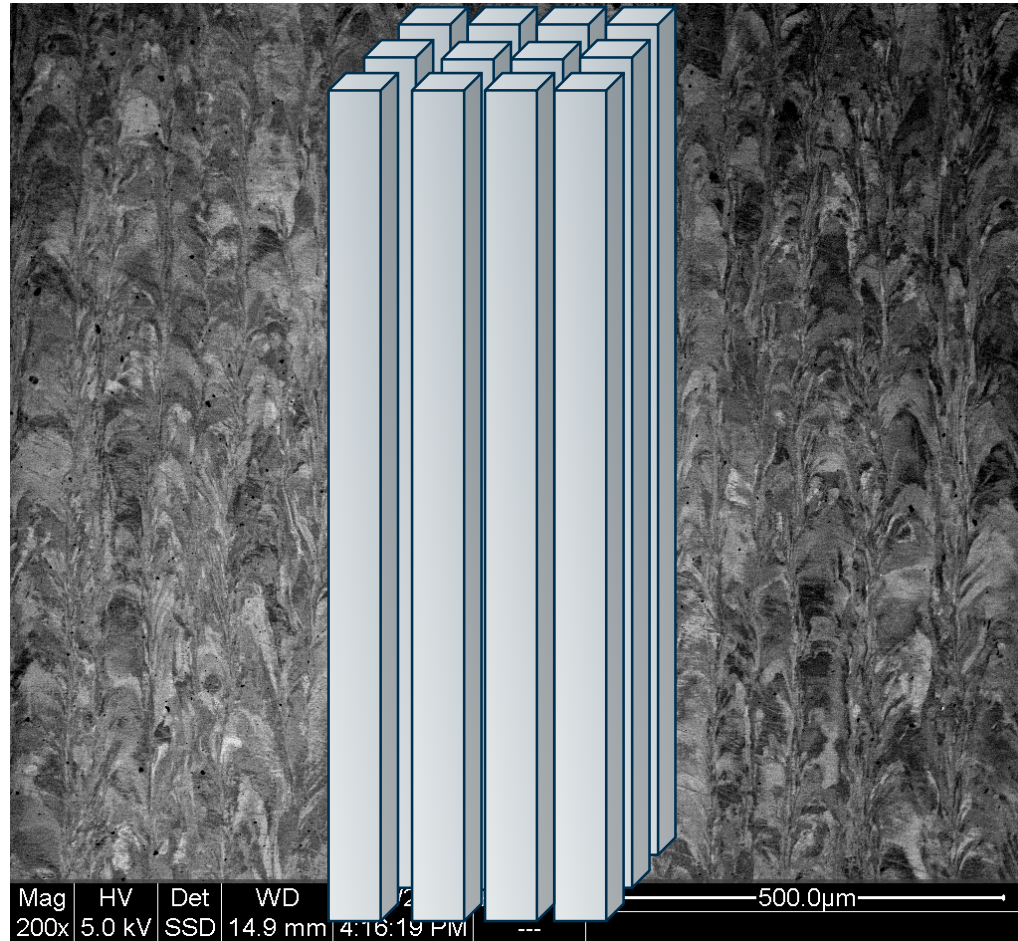
MATERIAL AND EXPOSURE CONDITIONS

- A FeCrAl alloy
 - Exposure: 900 °C for 168 h in air
- 2 superalloys from Siemens Industrial Turbomachinery (SIT)
 - Exposure: to be confirmed

PRELIMINARY RESULTS

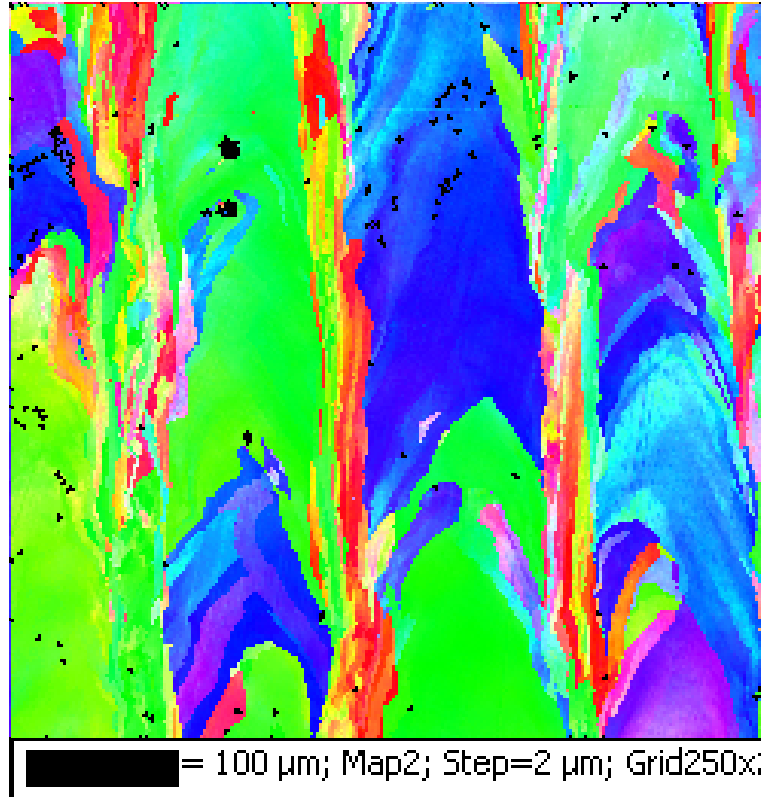
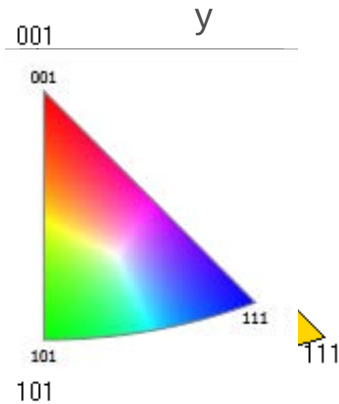


⌘ cut



PRELIMINARY RESULTS

As printed FeCrAl/ x cut

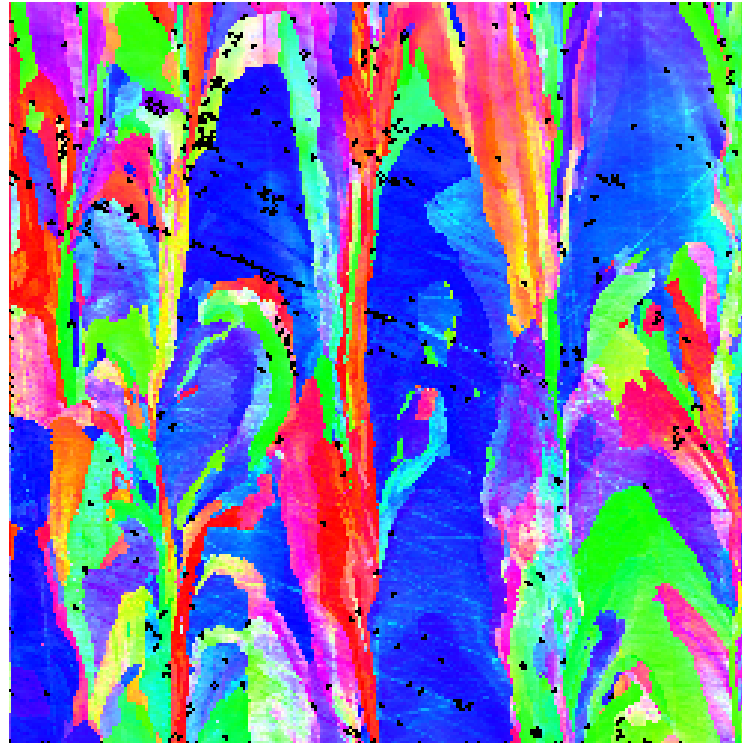
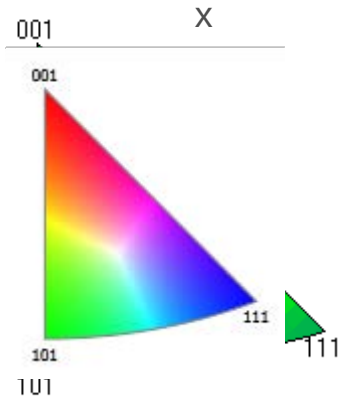


IPF map

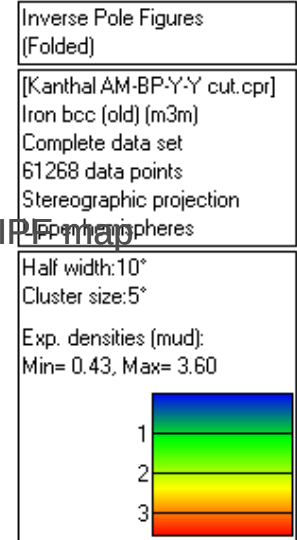
Inverse Pole Figures (Folded)
[Kanthal AM-BP-X-X cut-4.cpr]
Iron bcc (old) (m3m)
Complete data set
57919 data points
Stereographic projection
Upper hemisphere
Half width:10°
Cluster size:5°
Exp. densities (mud):
Min= 0.25, Max= 2.71

PRELIMINARY RESULTS

As printed FeCrAl/ y cut



100 μm; Map2; Step=2 μm; Grid250x2



FUTURE WORK

- SEM/EDX/EBSD before and after exposure
- FIB lift-out on down selected samples
- Analytical TEM on the down selected samples



CHALMERS

UNIVERSITY OF TECHNOLOGY