Karlsruhe Institute of Technology

Institute for Applied Materials

*contact:
Jan Hoffmann
e-mail: j.hoffmann@kit.edu
phone: +49 (0) 721 6082 3476

Al-containing ferritic oxide dispersion strengthened alloys

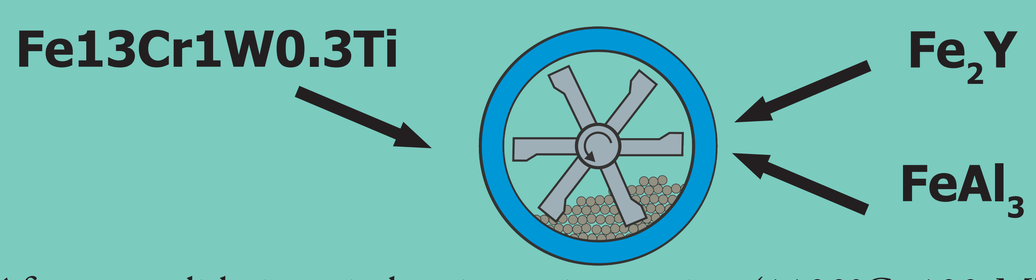
Production, Microstructure, Mechanical Properties and Oxidation

Jan Hoffmann[1*], **Michael Rieth**[1], **Anton Möslang**[1]

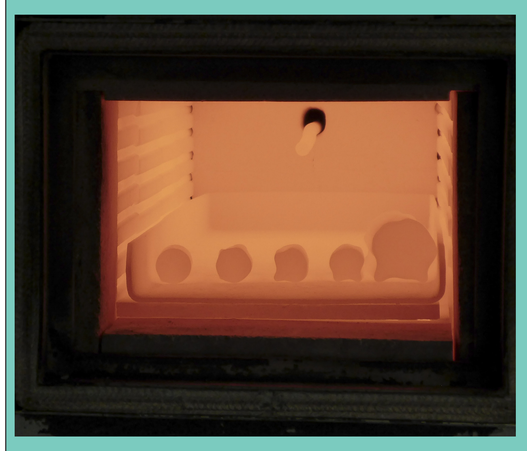
[1] Karlsruhe Institute of Technology, Institute for Applied Materials IAM-AWP, Karlsruhe, Germany

Production

Four different ODS alloys with **0,2,3 and 4 % - Al** were produced by mechanical alloying of **Fe13Cr1W0.3Ti + Fe_2Y** . The variation of the aluminum content was done by the addition of **$FeAl_3$** powder.

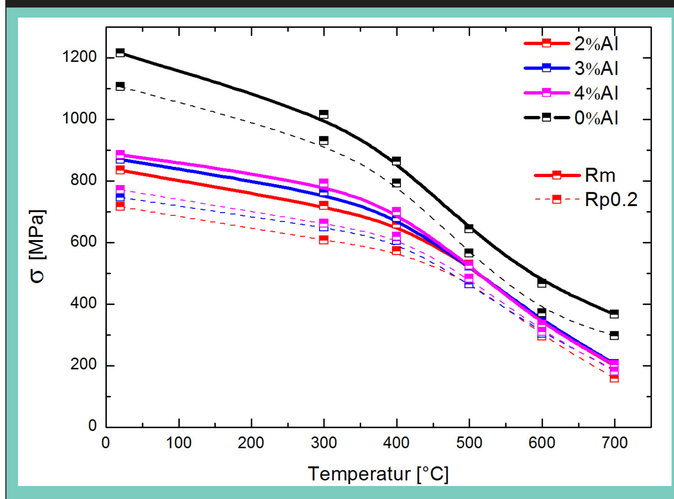


After consolidation via hot-isostatic pressing (1100°C, 100 MPa), the materials were hot-rolled from 45 mm to 6 mm in 5 passes at 1100°C with reheating after each pass.



A final heat treatment was performed at 800°C for 1 hour.

Mechanical Tests

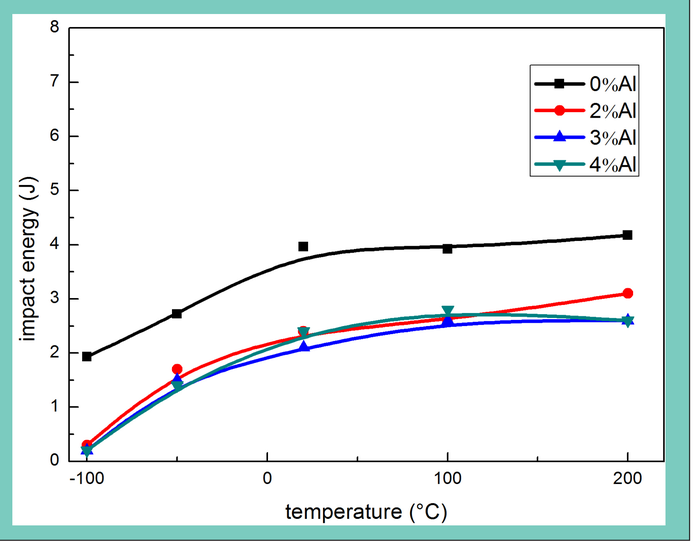


The tensile tests show a significant drop in strength for the Al-added alloys.

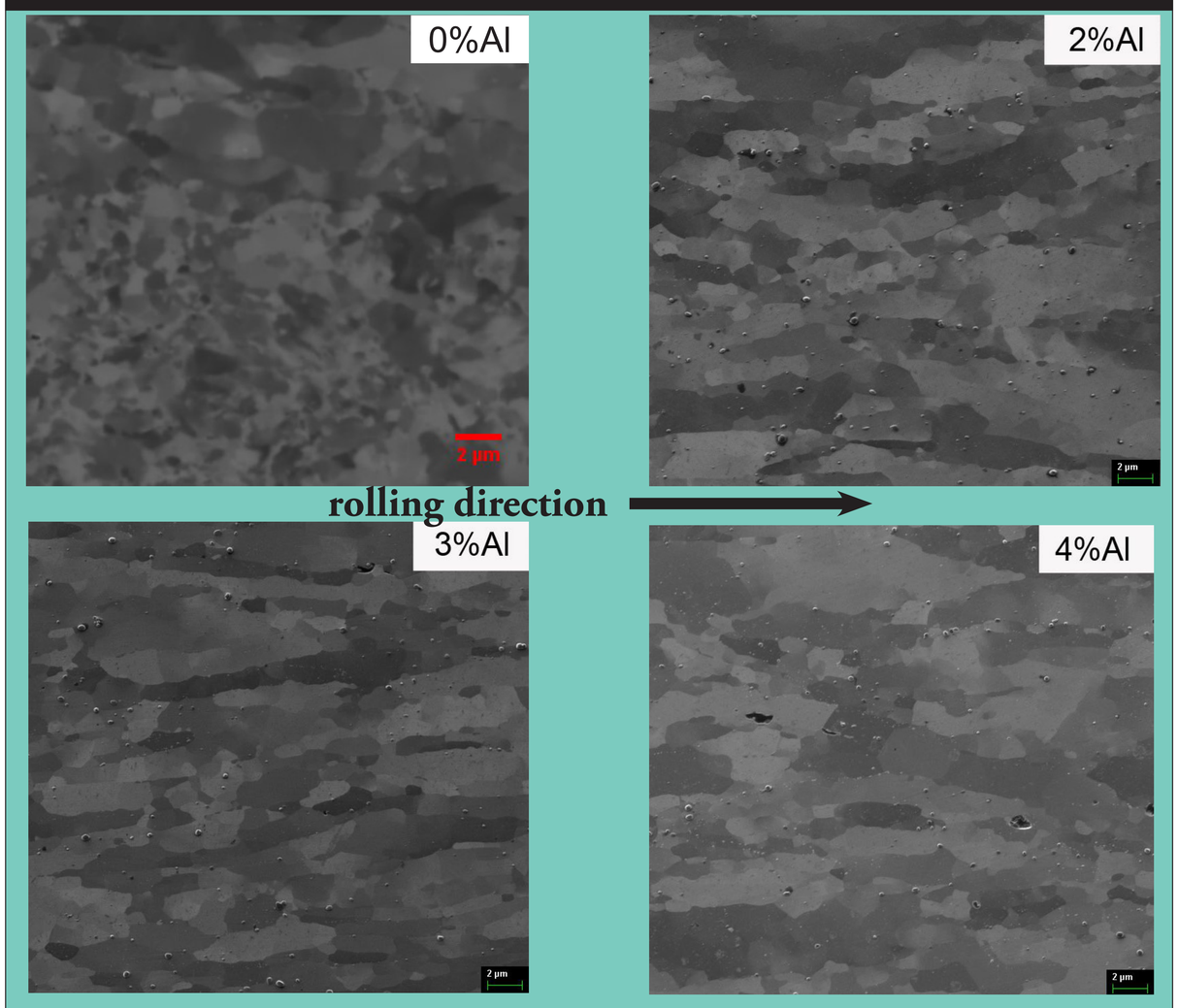
All Al-ODS materials show similar behaviour in the range of the operating temperatures (600°C)

Nearly no differences can be observed for the absorbed energy and DBTT values.

The overall toughness of the 0%Al alloy is higher.

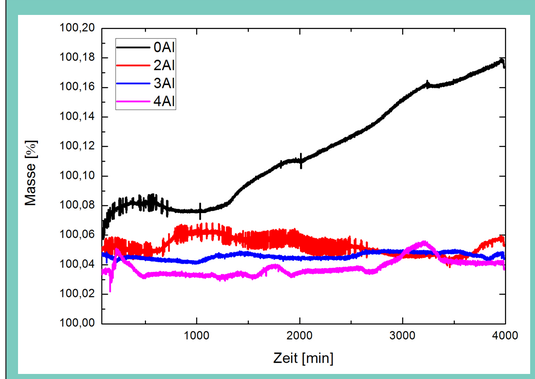


Microstructure



Minor differences were observed in the grain size distribution. The 0%Al-material has a smaller and bi-modal grain size distribution.

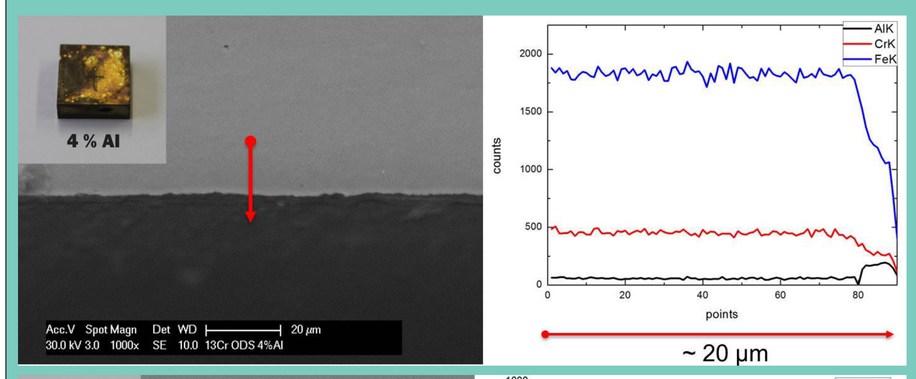
Oxidation



The four alloys were annealed at 800°C for 70 hours in dry air / 10% argon atmosphere.

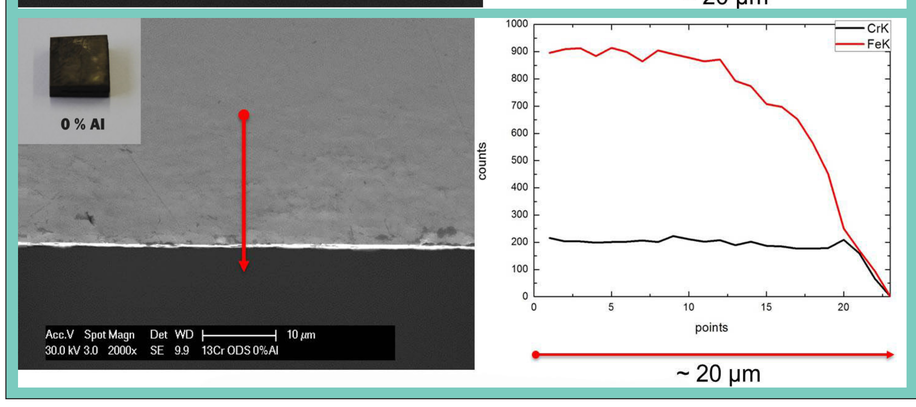
AL-ODS: Protective layer formed

non-AL ODS: static increase of oxidation and weight.



AL-ODS:

Al-oxide layer formed.



non-AL ODS:

Cr-rich layer formed.

KIT - University of the State of Baden-Wuerttemberg and National Research Center of the Helmholtz Association

This project has received funding from the European community's Seventh framework program (FP7/2007-2013) under grant agreement N°269706 - MATTER Project. The Karlsruhe Institute of Technology and the Materials Department of the University of Oxford are acknowledged for the overall use of their facilities.

www.kit.edu