



Al-containing ferritic oxide dispersion strengthened alloys

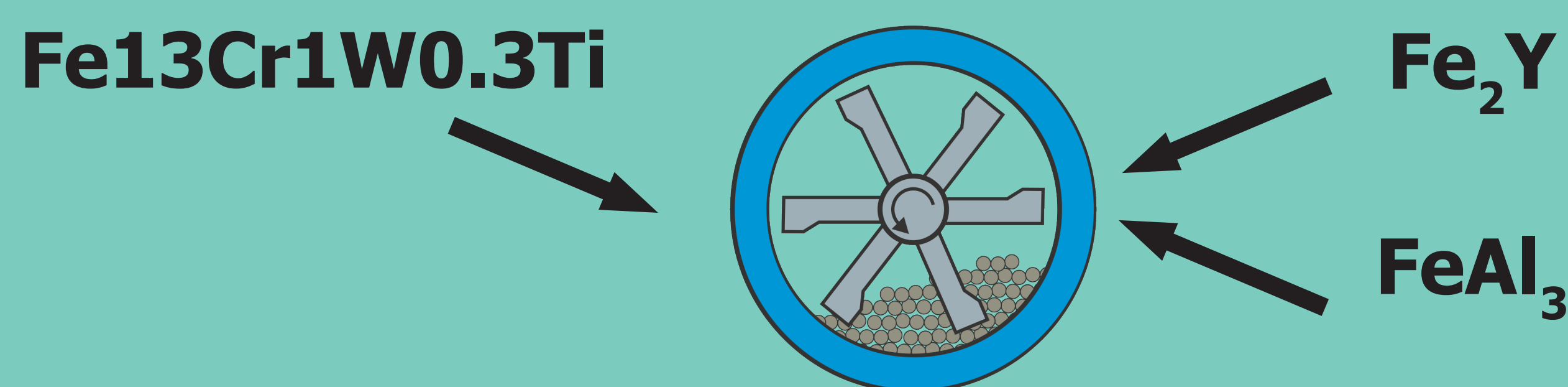
Production, Microstructure, Mechanical Properties and Oxidation

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Production

Four different ODS alloys with 0,2,3 and 4 % - Al were produced by mechanical alloying of $\text{Fe}_{13}\text{Cr}_1\text{W}_{0.3}\text{Ti} + \text{Fe}_2\text{Y}$. The variation of the aluminum content was done by the addition of FeAl_3 powder.

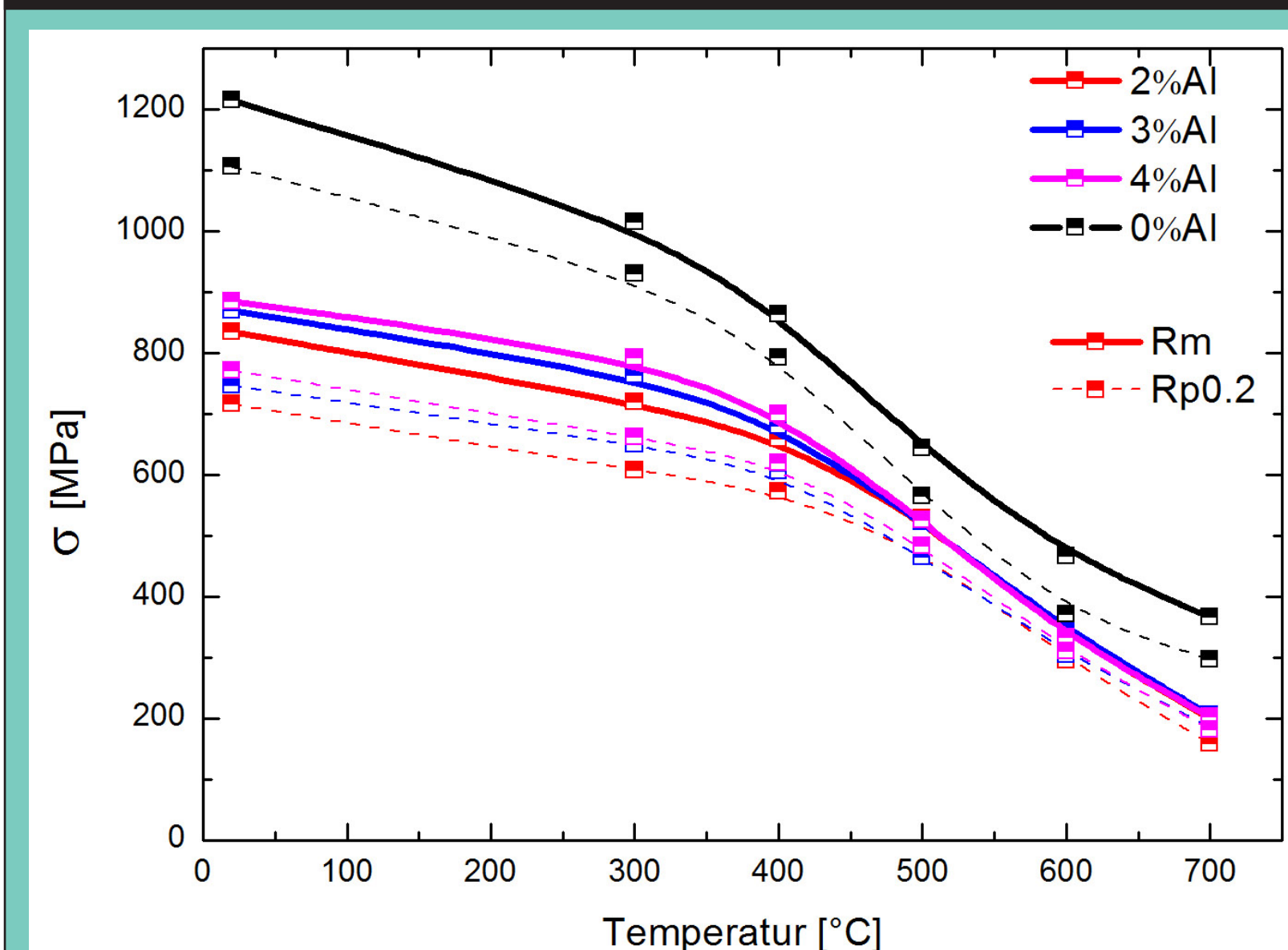


After consolidation via hot-isostatic pressing (1100°C, 100 MPa), the materials were hot-rolled from 45 mm to 6 mm in 5 passes at 1100°C with reheating after each pass.



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

Mechanical Tests

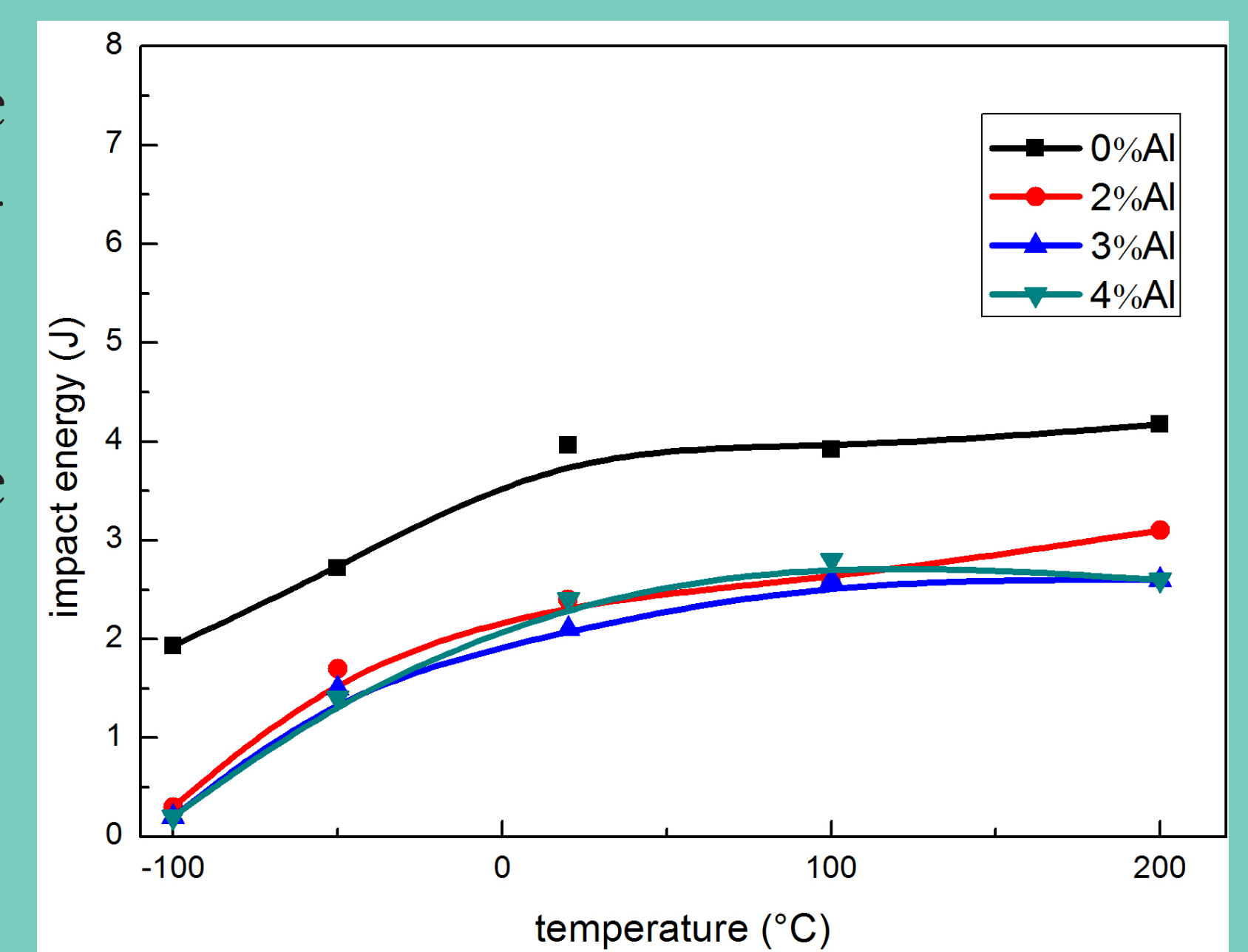


The tensile tests show a significant drop in strength for the Al-added alloys.

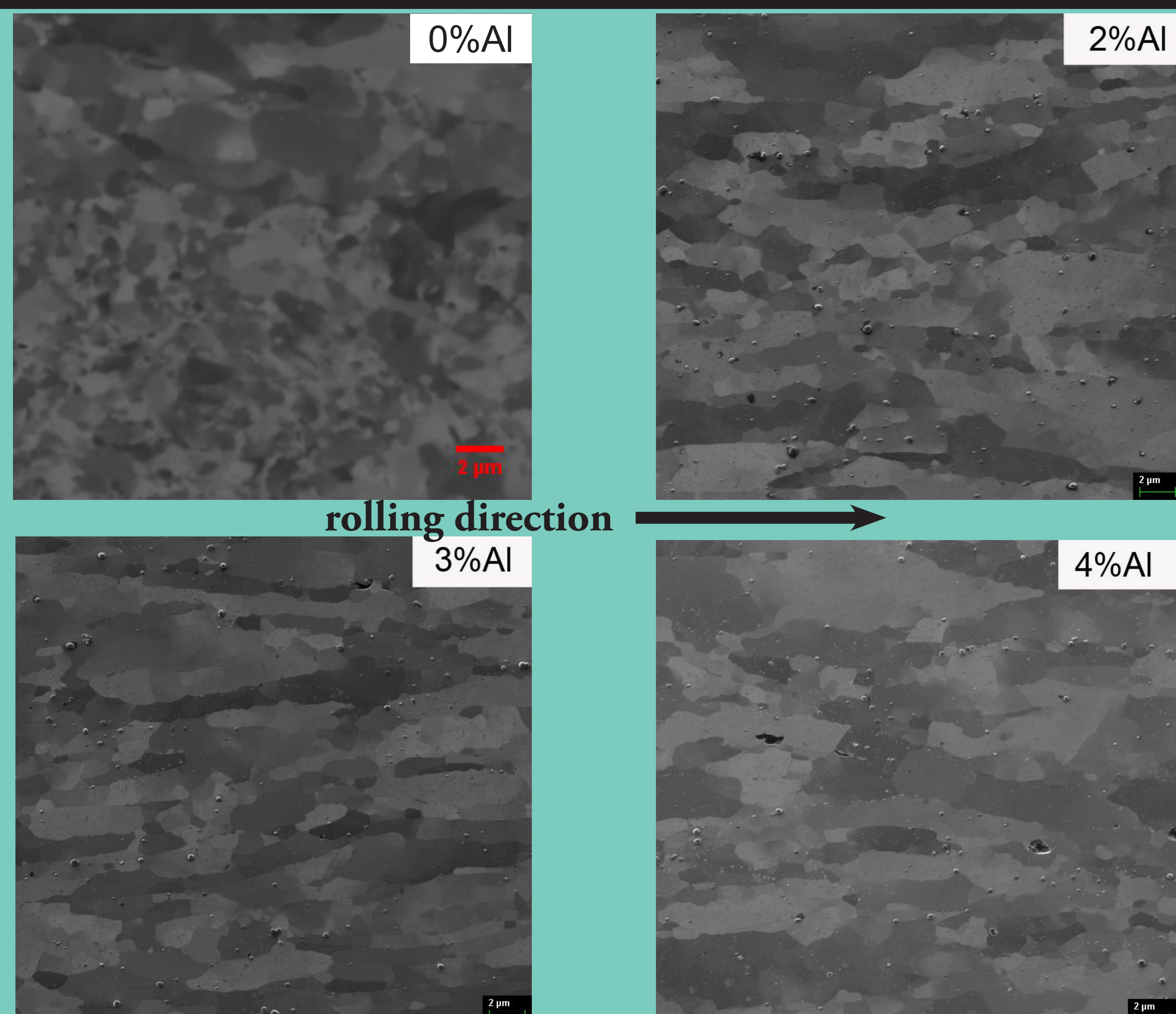
All Al-ODS materials show similar behaviour in the range of the operating temperatures (600°C)

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

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

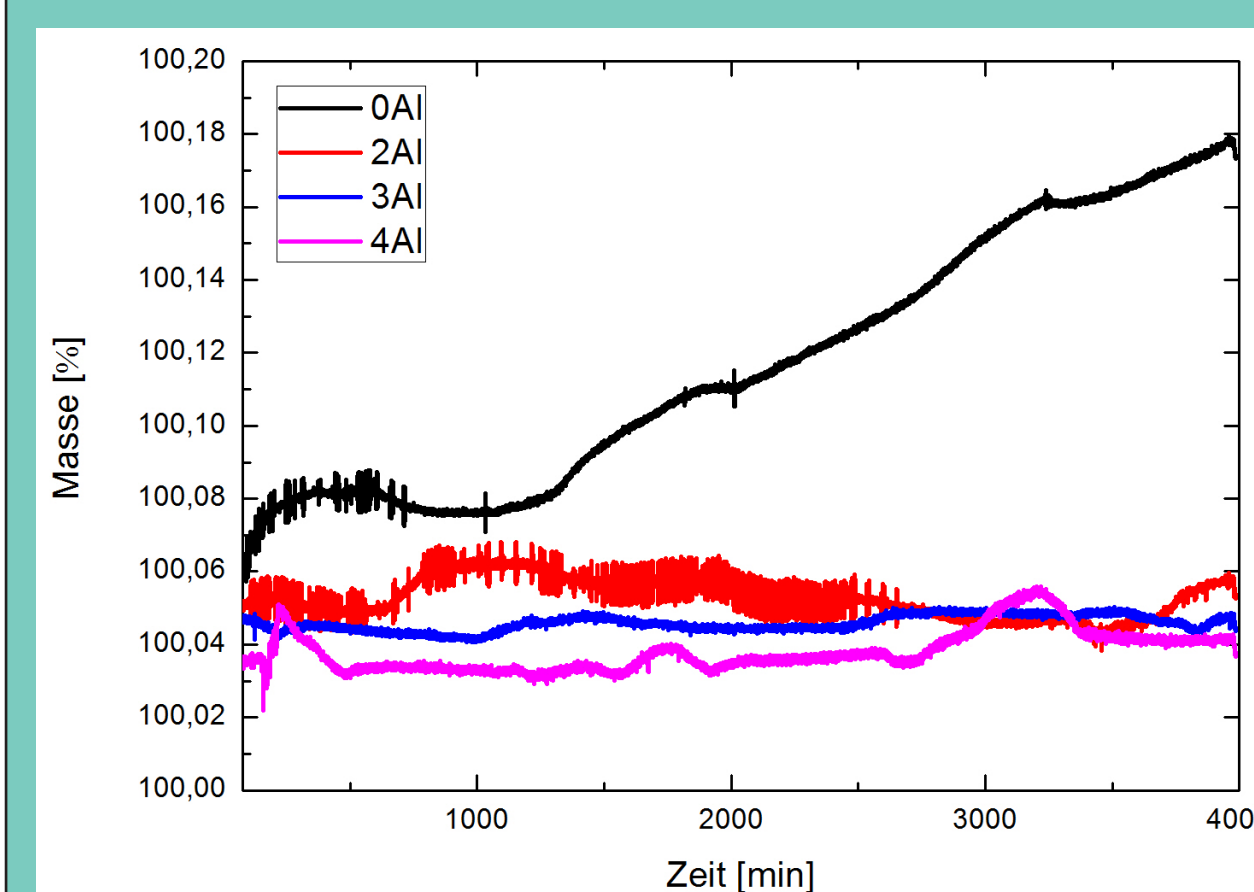


Microstructure



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

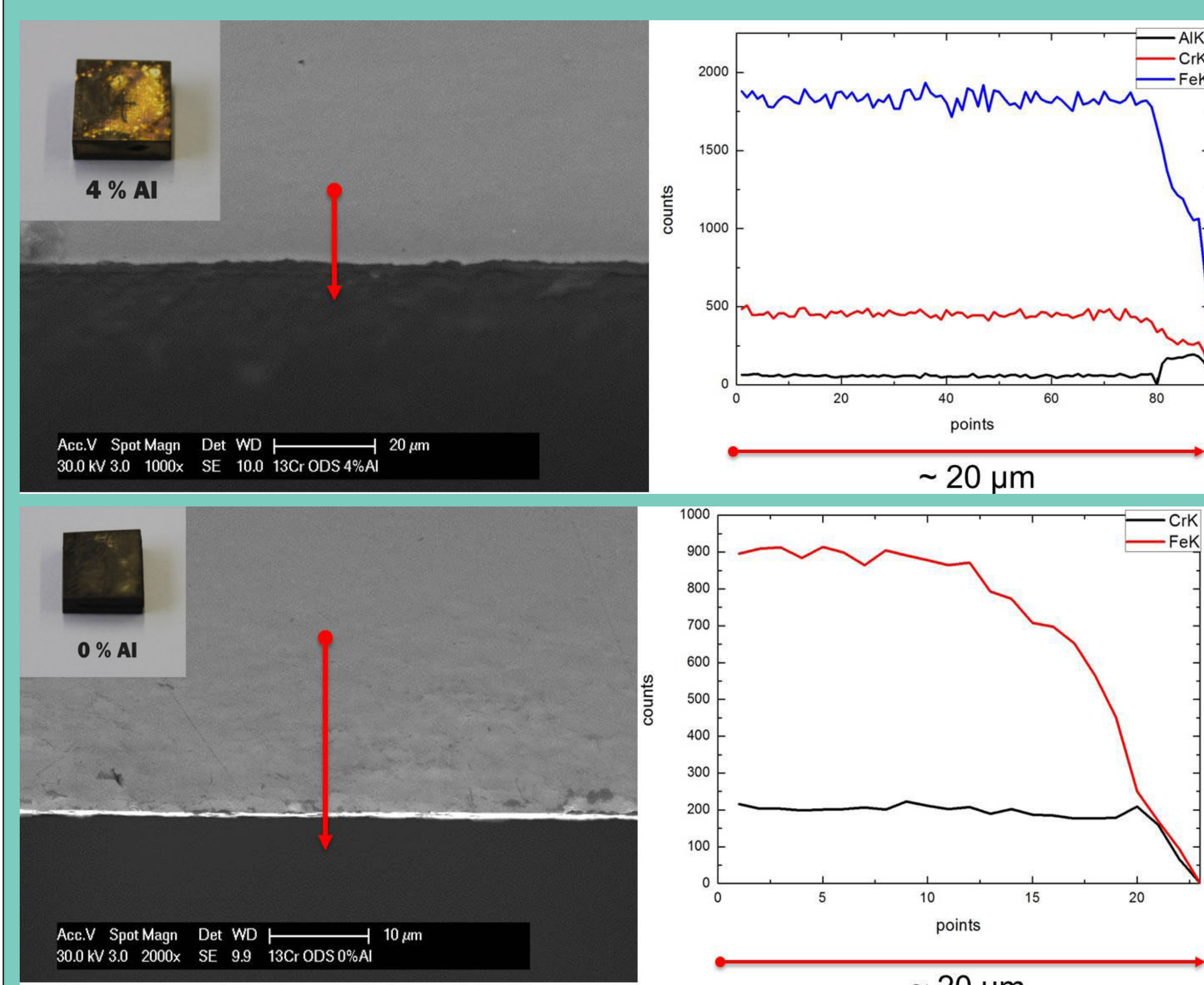
Oxidation



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.