



Contribution ID: 170

Type: **Poster**

High-temperature stability of matrix in boron-containing Co-Re-Cr alloys for gas turbine applications

Monday, 17 September 2018 17:45 (15 minutes)

Co-Re-based alloys [1] are developed to supplement single crystal Ni-based superalloys in future gas turbines. Addition of boron to the Co-Re-based alloys largely increases their ductility [2] and is thus advantageous. On the other hand, the stability of the matrix at the foreseen metal operation temperatures ($\geq 1200^\circ\text{C}$), which can be influenced by the presence of boron, is also an important concern for the alloy development.

Therefore, the influence of boron addition on Co-Re stability was investigated in situ at high temperatures using neutron diffraction (MLZ Garching). It was found for the Co-17Re-23Cr alloy that the increased boron concentration changes significantly, but not monotonically, the hcp to fcc matrix transformation temperature [3]. The reason is an interplay between amount of boron in the matrix and amount of sigma phase (Cr_2Re_3) which binds hcp-stabilizing element Re.

Moreover, increasing boron concentration also lowers temperature at which evaporation of Co and/or Cr occurs, followed by an appearance of second or even third hcp matrix phase. The formation of these additional hcp phases was observed at temperatures $>1430^\circ\text{C}$. This effect is not detrimental to the alloy development as the evaporation starts significantly above the foreseen operation temperature.

[1] J. Rösler et al., *Adv.Eng.Mater.* 9, 2007, 876

[2] D. Mukherji et al., *Scr.Mater.*66, 2012, 60

[3] P. Strunz et al., *Met.Mater.Int.*, 2018, doi.org/10.1007/s12540-018-0121-8

Primary authors: STRUNZ, Pavel (Nuclear Physics Institute); MUKHERJI, Debashis (TU Braunschweig); Dr BERAN, Přemysl (Nuclear Physics Institute); GILLES, Ralph; HOFMANN, Michael; KARGE, Lukas; HOELZEL, Markus; Prof. RÖSLER, Joachim (Tu Braunschweig)

Presenter: STRUNZ, Pavel (Nuclear Physics Institute)

Session Classification: Poster session 1

Track Classification: P8 Functional materials and materials science