Poster Presentation

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Effect of boron addition on phase transformations in Co-Re-Ta-C alloys

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There is a need to develop alloys for future gas turbines to enable the increase of gas entry temperatures above 1500 °C and improve their efficiency. Co-based alloys with addition of refractory element Re are promising candidates since they have the required high melting point as well as high strength [1].
Co-Re-based alloys are precipitation hardened by tantalum carbides. The TaC phase is a strongly nonstoichiometric interstitial compound which exists over a wide composition range in the binary Ta-C system. Their stability at high temperatures (>1200°C) in Co-Re alloys has been previously demonstrated [2].
To improve ductility of Co-Re-based polycrystalline alloys, it is necessary to add boron [3]. However, the boron addition dramatically influences the allotropic transformation temperature of the Co matrix (hcp ↔ fcc) and the stability of the matrix, particularly in alloys without Cr additions.
To understand the structural changes and phase stability, we used in-situ neutron powder diffraction technique. In the present study the Co matrix transformation temperature and changes in the fine TaC dispersion were studied in alloys containing 0.1 and 0.4 at. % boron. Two different heat treatment procedures up to 1500°C were used in the in-situ cycles. Moreover, measurement on consecutive second cycle were carried out to study the metastable fcc Co phase. The results are compared with alloys without boron addition and discussed.
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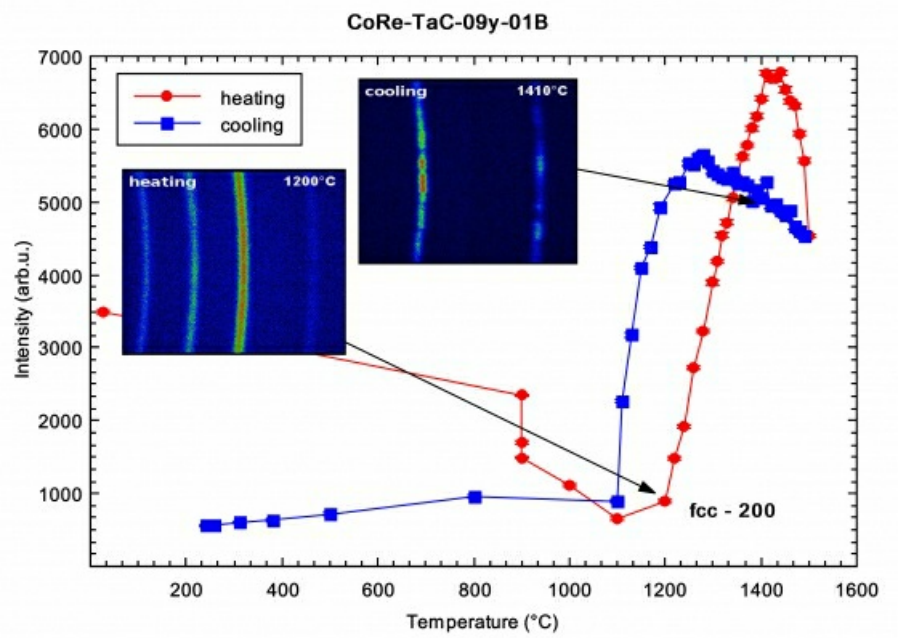

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