

Stability and growth of TaC precipitates in Co-Re superalloys for ultra high temperature applications studied by in-situ SANS

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Co-Re alloys are being developed in order to supplement Ni-base superalloys in future gas turbines for ultra-high temperature applications. The complex interplay between the different existing mesoscopic phases could be studied in-situ at high temperatures. It was shown that the amount and distribution of the stabilizing monocarbide of TaC phase strongly depends on the stoichiometry of alloyed components. The stability of a fine distribution of TaC in the CoRe matrix could be shown at temperatures up to 1300°C. Currently, the effect of different heat treatments is under investigation and in-situ SANS and microscopic studies show long-term stability of very small (< 80 nm) TaC precipitates. Additionally, it was possible to observe time resolved phase transformations of large precipitates (~100 nm) in-situ with a time resolution of 10 seconds. This method makes it possible to observe fast changes in the particle size with any associated change in volume fraction.

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