



INTERDISCIPLINARY CENTRE FOR
ADVANCED MATERIALS SIMULATION

ICAMS Special Seminar

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γ' Hardened cobalt-base superalloys A new class of high temperature materials

Conventional Co-based alloys are suitable materials for use in corrosive environments at high temperatures. However, the classic Co-based alloys with high Chromium contents cannot compete with γ' (Ni_3Al) hardened Ni-base superalloys in terms of strength as they are only carbide and solid solution hardened. Accordingly, these alloys are only used as materials for static parts in gas turbines for energy conversion, for example.

However, this situation could change in the future due to the discovery of the ternary compound $\text{Co}_3(\text{Al,W})$ in 2006 [1]. This stable intermetallic phase with L1_2 crystal structure is in equilibrium with the face centered cubic Co solid solution and therefore γ/γ' Co-base superalloys with microstructures similar to Ni-base superalloys can be generated. This new class of high temperature materials shows promising properties but is still in its early stages of development.

In this talk the positive aspects of Co as base material will be discussed and the microstructures as well as the thermo-physical, mechanical and oxidation properties of these new γ/γ' Co-base superalloys will be presented and compared with Ni-base superalloys. Additionally, it will be shown how systematic alloy development can lead to competitive alloys with well-balanced properties.

[1] Sato et al., Cobalt-Base High-Temperature Alloys, Science 312 (2006) 90-91

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