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# Tensile properties of Co-based oxide dispersion strengthened superalloys

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## Abstract

Tensile properties of a novel Co-20Cr-5Al-2.4Hf-1.5$Y_2O_3$ (wt%) oxide dispersion strengthened (ODS) superalloy were studied through a comparing investigation with Co-20Cr-5Al (wt%) alloy. Both the Co-based alloys (with and without oxide particles) were fabricated by mechanical alloying (MA), spark plasma sintering (SPS), hot rolling and the final annealing at 1200 ºC. Due to the ultrafine grains of 500 nm in the ODS superalloy and 1.2 μm in the ODS free alloy, the metastable fcc structure predominates at room temperature. Tensile testing was conducted at room temperature and 1000 $^{o}$C. Strain-induced twinning deformation was evidenced by transmission electron microscopy and was found to significantly enhance the ultimate tensile strength (UTS) of the two alloys at room temperature. The Co-based ODS superalloy exhibits a superior tensile strength of 2.85 GPa at room temperature, which is associated with the distribution of twins and fine Y-Hf oxides. At 1000 $^{o}$C, since the ultrafine grain size in the ODS superalloys, an easy grain boundary deformation occurred and resulted in a significant reduction in the UTS value.

**Keywords**

Co-based superalloys; Oxide dispersion strengthening; strain-induced twin

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