ALLOYING EFFECTS ON THE OXIDATION BEHAVIOUR OF SHOT-PEENED CO-NI BASE SUPERALLOYS

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The effect of shot-peening on the oxidation mechanism in Co-Ni alloys with different Co-Ni ratios and varying Cr and Al contents were investigated at 850 °C for 200 h. A characterization method using isotopic oxygen tracing combined with focused ion-beam secondary ion mass spectrometry (FIB-SIMS) was performed to study the oxidation mechanism in both conditions. Multi-layered oxides in both peened and un-peened conditions consisted of chromia-rich scale on the outermost surface and a protective alumina-rich layer as the internal scale. Internal oxidation to different depths occurred within the alloys with the formation of alumina particles within a γ'-depleted zone. The morphology of the sub-surface oxides differed between the two surface conditions examined. Oxidation performance was quantified by measuring cross-sectional damage depths of the outer scale (chromia) and the internal oxidation depth (oxide fingers and y'-depleted depth). Oxidizing environments can promote recrystallization in the near-surface of the shot-peened conditions. The sub-surface oxide penetration for the shot-peened condition occurs to a more uniform depth and is associated with the grain boundaries of small recrystallized grains. This work forms part of an ongoing investigation to determine the effects of shot-peening in this alloy system with the oxidation performance to equivalent polished material at 850 °C.