

Cyclic Oxidation Resistance of Rare Earth Oxide Gel Coated Fe-Cr Alloys

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Use of rare earths to increase high temperature oxidation resistance of chromium dioxide and alumina forming alloys is well known. Rare earth oxide coatings obtained by the sol-gel technique have been found to be very efficient to apply fine oxide coatings. The cyclic oxidation resistance (RT-900°C) of Fe-Cr alloy coated with various rare earth oxide gel coatings (La₂O₃, CeO₂, Pr₂O₃, Nd₂O₃, Sm₂O₃, Gd₂O₃, Dy₂O₃, Y₂O₃, Er₂O₃, and Yb₂O₃) was determined. Specimens coated with La₂O₃ and Pr₂O₃ gels were found to be the most resistant to cyclic oxidation. In an extension of this study, the effect of cooling rate, (and consequently thermal shock resistance) from the peak temperature (900°C, 1000°C, 1100°C) to room temperature of specimens coated with La₂O₃ and Pr₂O₃ gels was studied. The morphology and coverage of the rare earth oxide gels varied with the type of rare earth. The cyclic oxidation resistance increased with increase in time at temperature required to reach a specific chromium dioxide layer thickness. This in turn was influenced by rare earth ion radius and other characteristics of the rare earth oxide coating such as morphology, stability, coverage, resistance to thermal stresses and adhesion.

Palavras-Chave:

rare earths, chromium dioxide, oxidation resistance