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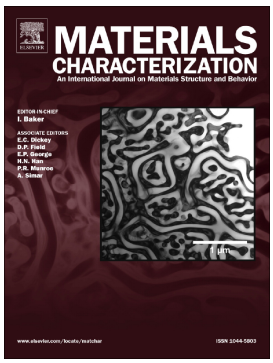

Characterization of oxide layer and micro-crack initiation in alloy 316L stainless steel after 20,000h exposure to supercritical water at 500°C

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Characterization of oxide layer and micro-crack initiation in alloy 316L stainless steel after 20000 h exposure to supercritical water at 500 °C

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Abstract

Corrosion behaviour of alloy 316L stainless steel capsule was studies by exposure to the supercritical water at 500 °C and 25 MPa for 20000 h. Transmission electron microscopy (TEM) was used to study the internal oxidation and micro-crack initiation on the surface. Elemental analyses indicated that long-term exposure to the SCW resulted in formation of scales identified as Fe_3O_4 (outer layer), Fe-Cr spinel/$(Fe,Ni)Cr_2O_4$/$(Mn,Cr)_2O_3$/SiO_2 (inner layer) on the substrate, and Ni-enrichment (chrome depleted region) in the alloy 316L. Micro-crack initiation was observed ahead of the oxidized grain boundaries in which elemental enrichments happened ahead of the crack tip. The relevance of the observed oxidation phenomena on the crack susceptibility of Alloy 316L was discussed.

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