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Materials Characterization

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Chapter 9
Aging of Cast Heat Resisting Alloys 35Cr–45Ni–0.1C (MORE40X) and 40Cr–45Ni–0.2C (UCX)

Ireri Aydée Sustaita Torres, Sergio Haro Rodríguez, and Rafael Colás Ortiz

Abstract Heat resisting cast alloys are designed to sustain operation while are exposed to temperatures greater than 650 °C. These alloys have widespread uses in petrochemical industry in pyrolysis and reformer furnaces, etc.; in addition, they can be hold into oxidizing, sulfidizing, or carburizing environments. The principal attributes of the alloys are creep strength and corrosion resistance. The purpose of this study was to explore the effects of chromium contents in two centrifugal cast pipes of Ni-base heat resistant alloys, one MORE40X 0.1C and the other UCX 0.2C during aging. The behavior of this alloys during aging was examined by optical and scanning electron microscopy in samples aged at 750 °C up to 1,000 h. The microstructural evolution was analyzed on selected samples and images using secondary and backscattered electron detectors and with X-ray energy dispersive spectroscopy. The main microstructural changes in primary and secondary carbides that occurred during aging were described and related to mechanical properties in two alloys. The microstructure as cast materials shows a primary carbides network, in austenitic matrix. The aging times produced different changes in the alloys, which dependent of the composition, morphology, distribution and in the transformation of carbides inside them. It was found that aging promoted the increment in tensile strength and the reduction in ductility. However the mechanical properties of UCX (aged at 750 °C up to 1,000 h) are better with respect to MORE40X (as cast).

Keywords Heat resisting cast alloys • Strength • Corrosion resistance • Optical • Scanning electron microscopy (SEM)

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