

Effect of Demineralized Water Purity on the Corrosion Behavior of Steel Alloys

Authors : A. M. El-Aziz, M. Elsehamy, H. Hussein

Abstract : Steel or stainless steel have reasonable corrosion behavior in water, their corrosion resistance is significantly dependent on the water purity. It was not expected that demineralized water has an aggressive effect on steel alloys, in this study, the effect of water with different purity on steel X52 and stainless steel 316L was investigated. Weight loss and electrochemical measurements were employed to measure the corrosion behavior. Samples were microscopically investigated after test. It was observed that the higher the water purity the more reactive it is. Comparative analysis of the potentiodynamic curves for different water purity showed the aggressiveness of the demineralised water (conductivity of 0.05 microSiemens per cm) over the distilled water. Whereas, the corrosion rates of stainless steel 858 and 623 nm/y for demi and distilled water respectively. On the other hand, the corrosion rates of carbon steel x52 were estimated about 4.8 and 3.6 $\mu\text{m}/\text{y}$ for demi and distilled water, respectively. Open circuit potential (OCP) recorded more positive potentials in case of stainless steel than carbon steel in different water purities. Generally, stainless steel illustrated high pitting resistance than carbon steel alloy, the surface film was investigated by scanning electron microscopy (SEM) and analyzed by energy dispersive X-ray spectroscopy (EDX). This behavior was explained based on that demi and distilled water might be considered as 'hungry water' in which it wants to be in equilibrium and will pull ions out of the surrounding metals trying to satisfy its 'hunger'.

Keywords : corrosion, demineralized water, distilled water, steel alloys

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020