Electrochemical Corrosion Behaviour of Different Cu-Base Alloys in Concentrated LiBr Solutions: Part I - Cu/10Ni and Al-Bronze Alloys

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The behaviour of Cu\10Ni and Al-bronze in different concentrations of Li Br solution has been studied using electrochemical measurements and surface analysis techniques. Potentiodynamic polarization measurements found that there is no any type of local attack observed for Cu/10Ni at 4M LiBr and one step recorded at low current density as a result of the formation of the inner doped Cu₂O with Ni. The hysteresis loop area was appeared at very small current density in the second anodic cyclic polarization in case of Cu/10Ni of solution containing the soluble corrosion product (SCP) of each of Cu/10Ni, Cu/30Ni, Cu/30Zn and Cu/7Al. This is due to the increase in the thickness of both the inward doped oxide film and the outer oxide film formation, which become protective enough to produce pitting attack at the weak points on the surface. In case of Cu/7Al, the inward doped Cu₂O cannot form and the general dissolution takes place. Surface analysis techniques using scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX) recorded an appearance for cavities or depressions in case of Cu/10Ni and Al-bronze. In 6 M LiBr Cu\10Ni, in presence of SCP of Al-bronze, Cu\10Ni recorded a large hysteresis loop area at very low current density, which is larger than that recorded at 4M LiBr due to the increase of the concentration of SCP. The EDX analysis of Cu\10Ni after treated for 120 min using current–time measurement indicated that inside the pits, Cu and Ni present on the surface with very small amount, while Br shows a higher value than outside and confirms the role of Br⁻ in the pitting attack. The mechanism of pitting corrosion of Cu/10Ni in concentrated solution of LiBr is discussed. The dealuminification of the surface in case of Cu\7Al occurs either outside or inside the cavities.

Keywords: Cu-base alloys; corrosion; LiBr; potentiodynamic polarization; chronoamperometry

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