Electrochemical and Surface Investigation of Ni-Cr Glassy Alloys in Nitric Acid Solution

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To understand the corrosion and passivation behaviour of $\text{Ni}_{70}\text{Cr}_{21}\text{Si}_{0.5}\text{B}_{0.5}\text{P}_{0.1}\text{C}_{\leq 0.1}\text{Co}_{\leq 1}\text{Fe}_{\leq 1}$ (VZ1) and $\text{Ni}_{72.65}\text{Cr}_{7.3}\text{Si}_{6.7}\text{B}_{2.15}\text{C}_{\leq 0.06}\text{Fe}_{8.2}\text{Mo}_3$ (VZ2) glassy alloys they were studied in nitric acid at different concentrations (1.0- 12.0 M) by AC and DC techniques. Experimental investigations showed that both two alloys spontaneously passivated with a small active region followed by a well-defined passive and transpassive regions at all examined HNO_3 concentrations. Critical concentration was observed up to 6.0M HNO_3 for VZ1 alloy and up to 3.0M HNO_3 in the case of VZ2 alloy. Surface morphology was also studied by XPS, SEM, EDS, and AFM techniques after electrochemical measurements. The SEM results showed, deep pit propagation and aggressive surface dissolution with high average roughness values at critical concentration for both two alloys. The inner passive film of Cr_2O_3 and outer passive layer of NiO on VZ1 alloy resulting great resistivity.

Keywords: Ni-Cr glassy alloys, HNO_3 , Electrochemical study, morphology study.

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