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Effect of Aging on Corrosion Behavior of Martensite Phase in Cu-Al-Be Shape Memory Alloy

Ahmed Aziz Hamza
University of Technology, Iraq

Introduction: Cu-(13 wt. %) Al shape memory alloys with addition small amount of beryllium per elastic effect at room temperature, because the martensitic transformation from the austenite phase (β) have BCC crystal structure to marten site phase (18R) have monoclinic crystal structure [1-6]. The application of these alloy used as absorb vibration damping effect in bridge and building structure [7]. Heat treatment of this alloy like quenching from high temperature and then aging at different temperatures and time led to formation of different phases, and their Presence can affect their shape memory effect and corrosion behaviour [8-10]. In realistic applications, as the alloy is exposure to corrosion solution for a period of time they are exhibit to corrosion and pitting, for that reason study of corrosion behaviour like corrosion current and potential and pitting potential of the alloys are require to be done before they are put into biomedical and industrial applications. Since SMAs find a wide application in the marine, aerospace applications and it is also used in the surgical medical use such as guide wire, so it becomes necessary that the shape memory alloys high corrosion resistance to the environment in which it is being used.

Experimental Work: The master alloy of chemical composition Cu-13%Al-0.545%be was received as cast from France company and chemical composition was carried by oxford foundry expert type. Figure 1 and Table 1 show oxford foundry expert type and chemical compositions.

Homogenized at 800°C for 3 h within the β phase region and then betatized at 800°C for 30 min and quenching in salt ice water. Aging at 150°C at 2, 4, 6 h and quenching in salt ice water, water and oil media. The samples with dimensions 5 mm length and 14 mm diameter are (grinding with different wet paper 120, 320, 500, 1000, 2000 and wishing with water, polishing with cloth diamond and lubricant using polishing device then samples wishing with water, etching with solution 5 g FeCl3, 10 ml HCL and 100 Ml H2O. X-ray diffraction device type (shimadzu XRD-6000 X-Ray diffract meter) Figures 3 and 4 devices for microstructure and XRD 6000 shimadzu type.

Corrosion testing by carried out using open circuit potential, tafel polarization and cyclic polarization. Corrosion study by electrochemical cell contains solution 1 liter and inside container there are three electrodes and these electrode are contact to the potentiostatic. Figure 5 shows cell connecting three electrode and potentiostat.

ah_azez1583@yahoo.com

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