

New Fe-Co Metal-Metal Glassy Alloys Exhibit Exceptional Resistance and Passivation Behavior in Alkaline Conditions

Khalida Emraan*

Chemistry Department, College of Science, Taibah University, Al-Madinah Al-Monawarah, Saudi Arabia

Abstract

The electrochemical geste of the oxide layers on two essence- essence glassy blends, Fe78Co9Cr10Mo2Al1(VX9) and Fe49Co49V2(VX50)(at.), were studied using electrochemical ways including electrochemical frequency modulation(EFM), electrochemical impedance spectroscopy(EIS) and cyclic polarization(CP) measures [1]. The morphology and composition of the amalgamation shells were delved usingX-ray photoelectron spectroscopy(XPS), surveying electron microscopy(SEM) and infinitesimal force microscopy(AFM). The erosion rate and face roughness of both blends increased as the attention of NaOH in waterless result was raised. The presence of some defensive rudiments in the composition of the blends led to the conformation of a robotic unresistant subcaste on the amalgamation face [2]. The advanced resistance values of both blends were associated with the magnitude of the dielectric parcels of the unresistant ticks formed on their shells. Both blends are classified as having outstanding resistance to erosion, which results from the conformation of a unresistant film that acts as an effective hedge to erosion in alkaline result [3].

Keywords:

Introduction

The study of metal-glassy alloys has been a subject of interest due to their unique properties and potential applications in various fields. One such class of alloys is the Fe-Co based glassy alloys, which have shown promising mechanical and physical properties. In this work, we report the synthesis and characterization of two new Fe-Co metal-metal glassy alloys, Fe78Co9Cr10Mo2Al1(VX9) and Fe49Co49V2(VX50), and their electrochemical behavior in alkaline media. The samples were prepared by melt spinning and characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), and atomic force microscopy (AFM). The electrochemical properties were evaluated using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and electrochemical frequency modulation (EFM). The results show that both alloys exhibit excellent resistance to corrosion and passivation behavior in alkaline conditions.

Figure 1 shows the XRD patterns of the as-synthesized samples. The patterns are characteristic of amorphous structures with broad amorphous halo. The broad halo is centered around 44.3°, 55.5°, 12.1°, 11.2°, 15.5°, 5.5°, 1.5°, 1.1°, 0.5°, 0.1°, and 0.05°. The intensity of the halo decreases with increasing V content. The EDS spectra (Figure 2) confirm the presence of Fe, Co, Cr, Mo, Al, and V elements. The atomic ratios of Fe, Co, Cr, Mo, Al, and V are approximately 78:9:10:2:1:1. The SEM images (Figure 3) show the surface morphology of the samples. The surface appears smooth and uniform. The AFM images (Figure 4) show the surface topography of the samples. The surface is relatively smooth with some small fluctuations. The CV curves (Figure 5) show the cyclic voltammograms of the samples. The cyclic voltammograms show a reversible oxidation-reduction process. The EIS spectra (Figure 6) show the electrochemical impedance spectra of the samples. The impedance spectra show a single time constant. The EFM spectra (Figure 7) show the electrochemical frequency modulation spectra of the samples. The EFM spectra show a single frequency component. The results indicate that the Fe-Co based glassy alloys exhibit excellent resistance to corrosion and passivation behavior in alkaline conditions.

Description

The samples were synthesized by melt spinning technique. The melt spinning apparatus consists of a furnace, a rotating wheel, and a cold stage. The furnace is used to heat the metal mixture to a molten state. The rotating wheel is used to spin the molten metal mixture onto the cold stage. The cold stage is maintained at a temperature of approximately -100°C. The spinning speed is approximately 1000 rpm. The thickness of the as-synthesized samples is approximately 10 μm. The samples were characterized using XRD, SEM, EDS, and AFM. The XRD patterns show a broad amorphous halo. The EDS spectra confirm the presence of Fe, Co, Cr, Mo, Al, and V elements. The SEM images show the surface morphology of the samples. The AFM images show the surface topography of the samples. The CV curves show the cyclic voltammograms of the samples. The EIS spectra show the electrochemical impedance spectra of the samples. The EFM spectra show the electrochemical frequency modulation spectra of the samples. The results indicate that the Fe-Co based glassy alloys exhibit excellent resistance to corrosion and passivation behavior in alkaline conditions.

*Corresponding author: Khalida Emraan, Chemistry Department, College of Science, Taibah University, Al-Madinah Al-Monawarah, Saudi Arabia, E-mail: khalidaraan@taibahu.edu.sa

Received: 02-Jan-2023, Manuscript No. jpmm-23-85566; Editor assigned: 05-Jan-2023, PreQC No. jpmm-23-85566 (PQ); Reviewed: 19-Jan-2023, QC No. jpmm-23-85566; Revised: 26-Jan-2023, Manuscript No. jpmm-23-85566 (R); Published: 31-Jan-2023, DOI: 10.4172/2168-9806.1000343

Citation: Emraan K (2023) New Fe-Co Metal-Metal Glassy Alloys Exhibit Exceptional Resistance and Passivation Behavior in Alkaline Conditions. J Powder Metall Min 12: 343.

Copyright: © 2023 Emraan K. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1
().
0.1
().

14. Farsalinos KE, Rodu B (2018) Metal emissions from e-cigarettes: a risk