Characterization and corrosion behavior of (Fe\textsubscript{65}Co\textsubscript{35})\textsubscript{70}Al\textsubscript{30} nanostructure alloys obtained by mechanical alloying

A.HADDAD, Z.BOUTAGHOU, K.LOUNES, SBRICKCHAOUCHE, M.AZZAZ

Welding and NDT Research center (CSC)
BP64, route de Dely Brahim, Chéraga.Alger
Université des Sciences et de la Technologie Houari Boumediene

haddad_ah@hotmail.com
a.haddad@hcsc.dz

Abstract
In this work, the structure and corrosion properties of formation nanostructure alloys (Fe\textsubscript{65}Co\textsubscript{35})\textsubscript{70}Al\textsubscript{30} are investigated. A series of Nanocrystalline (Fe\textsubscript{65}Co\textsubscript{35})\textsubscript{70}Al\textsubscript{30} samples have been prepared using mechanical alloying based on planetary ball mill under several milling conditions. Mechanical alloying is a non-equilibrium process for materials synthesis. The structure obtained by mechanical alloying were investigated by scanning electron microscopy, X - Ray diffraction analysis, magnetic technique VSM and corrosion study. Consequently, alloy powder with an average grain size of 8 nm was obtained. The polarization and impedance curves of different samples in NaCl media showed the corrosion potential and corrosion resistance values increases with milling time (crystallite size). Experimental results show that fine nanocrystalline (Fe\textsubscript{65}Co\textsubscript{35})\textsubscript{70}Al\textsubscript{30} alloy powders prepared by mechanical milling have an interesting properties very promising for corrosion and magnetic applications.

Keywords: Fe-Co-Al powder; Mechanical alloying; Magnetic properties; corrosion.

Introduction
Mechanical alloying (MA) of metallic powders has become popular in recent years for the synthesis of nanostructured alloys through solid-state reactions. This technique modifies the structure and solid solubility limits of alloys and solid solutions and induces lattice strains and phase transformations due to collisions with balls and is repeatedly deformed, cold welded and fractured for producing materials alloying gives rise to interesting mechanical and magnetic properties.

The mechanism of phase formation has been explained by an interdiffusion reaction of the components occurring during the milling process. The formation of metastable phases and disordering of the lattice through alloying gives rise to interesting mechanical and magnetic properties [1].

Fe-Co alloys have been, for some time the ideal materials, the applications of a high magnetic saturation is a design parameter, particularly in the aerospace industries where volume and mass need to be minimized [1].

There were some methods to improve the material properties, such as composites, addition of other elements, heat treatment and control of grain size [2].

Especially, the control of grain size at nanometer and addition of other elements will effectively improve the properties of Fe-Co.

In the present study, we formed FeCoAl based alloys by MA and investigated their magnetic properties and corrosion behavior.