The influence of addition elements (Ti, B, Zr) on mechanical properties and corrosion resistance of intermetallic alloys FeAl-B2

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Abstract : The FeAl alloys have been the subject of extensive research in the 60s, but because of their excessive fragility, the use of doping by alloying elements has given hope to this alloy family and to relaunch search. In the context of the present work we studied alloys developed on the basis of the intermetallic Fe-Al40 in an arc furnace with adding alloying elements (Ti, B, Zr). This study aims to improve the mechanical strength and the corrosion resistance of this materials at ambient temperature.The microstructures were examined by the Optical microscope (OM) and scanning electron microscope (SEM). The different phases present in the material were identified by X-ray diffraction (XRD). Numbers hardnesses were determined by Vickers hardness test (HV) and Vickers microhardness measurements. The electrochemical studies were performed in using potentiodynamic polarization curves and the electrochemical impedance spectroscopy (EIS). Microstructural observations indicated the presence of precipitates which result from the introduction of B and Zr. Adding Boron in alloy FeAlTi reduces the hardness, but the combined effect of the (Ti, B, Zr) has led to a structural hardening at low temperature. It was observed that all elements added to the binary alloy FeAl improved the corrosion resistance, but the FeAlTiB alloy present the best features of protection against corrosion.

Keywords : Intermetallic alloys, FeAl B2, X-ray, mechanical properties.