

Waste-Based Surface Modification to Enhance Corrosion Resistance of Aluminium Bronze Alloy

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Abstract : Aluminium bronze alloys are well known for their superior abrasion, tensile strength and non-magnetic properties, due to the co-presence of iron (Fe) and aluminium (Al) as alloying elements and have been commonly used in many industrial applications. However, continuous exposure to the marine environment will accelerate the risk of a tendency to Al bronze alloys parts failures. Although a higher level of corrosion resistance properties can be achieved by modifying its elemental composition, it will come at a price through the complex manufacturing process and increases the risk of reducing the ductility of Al bronze alloy. In this research, the use of ironmaking slag and waste plastic as the input source for surface modification of Al bronze alloy was implemented. Microstructural analysis conducted using polarised light microscopy and scanning electron microscopy (SEM) that is equipped with energy dispersive spectroscopy (EDS). An electrochemical corrosion test was carried out through Tafel polarisation method and calculation of protection efficiency against the base-material was determined. Results have indicated that uniform modified surface which is as the result of selective diffusion process, has enhanced corrosion resistance properties up to 12.67%. This approach has opened a new opportunity to access various industrial utilisations in commercial scale through minimising the dependency on natural resources by transforming waste sources into the protective coating in environmentally friendly and cost-effective ways.

Keywords : aluminium bronze, waste-based surface modification, tafel polarisation, corrosion resistance

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