Defence S and T Technical Bulletin, vol. 6(2), 2013, pages 75-92

# Electrochemical characterisation of hybrid activators for aluminium sacrificial anodes in natural sea water

## Abstract

This paper reports on the electrochemical behaviour of as-cast Al-Zn-Mg alloys activated by tin (Sn) and ruthenium dioxide (RuO2) in natural sea water. The potential and advantages of Sn and RuO2 as hybridactivators in Al-Zn-Mg alloys will be studied by using direct (DC) and alternating (AC) currentelectrochemical measurement techniques. The morphology of the alloys' corroded surface was studied using a scanning electron microscope (SEM). This study showed that the addition of 1.5%wt. Sn as an alloying element gave a stable corrosion free process that can be achieved after 2 ks of immersion. The results also showed that RuO2 catalytic coating applied on the surface of Al-Zn-Mg-Sn alloy slightly shifted the values of open circuit potential (OCP) towards a more electropositive direction as compared to Al-Zn-Mg-Sn without RuO2. The morphology of the corroded surface of Al-Zn-Mg-Sn alloy coated with RuO2 showed a more uniform corrosion attack with the formation of porous and fibrous mud-like cracks on the outer layer. This type of corrosion morphology features were believed to facilitate ionic species adsorption and diffusion through corrosion product layer at solution-alloy interface. Electrochemical impedance spectroscopy (EIS) showed that both Sn and RuO2 are capable to activate Al-Zn-Mg-Sn alloy in sea water by modifying the electrical properties of the oxide layer, reducing resistance to polarisation Rp values and thus, activating and accelerating the aluminium alloy dissolution process

### Keywords

Aluminium sacrificial anodes; Corrosion morphology; Electrochemical impedance spectroscopy (EIS);Hybrid activators; Open circuit potential (OCP)