**Study on the effect of sodium carbonate salt as corrosion inhibitor for protection of AZ31 Magnesium alloy**

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Magnesium is the world’s lightest structural metal, with a significant growth potential in view of the accelerating demand for light-weighting portable devices and transportation (aerospace, automotive) amongst other. The effect of the sodium carbonate concentration on the corrosion protection of AZ31 magnesium alloy was studied in 0.1M NaCl solution using Electrochemical Impedance Spectroscopy (EIS) and potentiodynamic polarization measurements. The inhibitive effect of CO32- was tested in Mg(OH)2 non-saturated and saturated solutions in order to highlight the effects of pH and carbonate on the corrosion protection process. The morphology of the surface was analyzed by Scanning Electron Microscopy (SEM). X-ray Photoelectron Spectroscopy (XPS) was used in order to investigate the chemical surface composition. The hydrogen evolutions were carried out to evaluate the efficiency of the different investigated carbonate solutions. Finally, the influence of the surface/volume ratio of the electrochemical system was achieved using different flat cells. The inhibitive effect of CO32- on the corrosion of AZ31 magnesium alloys has been highlighted and the mechanism behind discussed.