

DIOCTYL SULFOSUCCINATE SODIUM SALT (AOT) AS A CORROSION INHIBITOR FOR AZ31 MG ALLOY AND MODIFYING AGENT FOR LAYERED DOUBLE HYDROXIDE (LDH)

Roya Malekhouyan¹, Yoann Paint², Xavier Noirlalise², Maurice Gonon¹,
David Cornil³, Jérôme Cornil³, Marie-Georges Olivier^{1,2}

1. Materials Science Department, Materials Institute, University of Mons, Place du Parc 20, Mons, 7000, Belgium
2. Materia Nova Research Center, Parc Initialis, 7000 Mons, Belgium
3. Laboratory for Chemistry of Novel Materials, University of Mons, Place du Parc 20, Mons, 7000, Belgium

Surfactants can be used as a corrosion inhibitor for metallic substrates such as magnesium (Mg) alloys. This study examines the corrosion inhibition properties of dioctyl sulfosuccinate sodium salt (AOT) on AZ31 Mg alloy using electrochemical impedance spectroscopy (EIS). Surface characterization is carried out using scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS). Density Functional Theory (DFT) calculations was also performed and showed an interaction energy of -5.25 eV between AOT and the substrate, validating the effectiveness of AOT in corrosion inhibition by being adsorbed on the surface of substrate. Additionally, AOT was incorporated into the layered double hydroxide (LDH) conversion coating which was formed on the AZ31 Mg alloy. SEM images and XRD tests confirm the existence of the LDH layer after immersion in the saturated AOT solution. Furthermore, the addition of AOT increases the inner layer thickness of the LDH from $11.8 \pm 0.2 \mu\text{m}$ to $16.3 \pm 0.3 \mu\text{m}$, significantly improving the corrosion resistance of the substrate. These findings underscore the potential of AOT as a corrosion inhibitor. Moreover, The modification of LDH with AOT could enhance the corrosion resistance of the substrate, which can be used as a surface pretreatment for further application of organic coatings.

Keywords: *Dioctyl sulfosuccinate sodium salt, AOT, AZ31 magnesium alloy, corrosion inhibitor, corrosion resistance, conversion coating, layered double hydroxide, LDH*

Acknowledgments

This research was funded by La Fédération Wallonie-Bruxelles (Belgium) through University of MONS (UMONS), ARC 2020 (Actions de Recherche Concertées) - PROCOMAG project, Grants attributed to Roya Malekhouyan and Louis Van Renterghem.