

# Effect of surface condition on the corrosion behaviour of AZ31 magnesium alloy

*M.I.M. Ramli a,b, M.A.F. Romzi c, J. Alias c, ↑*

aFaculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia, Pahang, 26600 Pekan, Pahang, Malaysia

bAutomotive Engineering Centre, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

cDepartment of Mechanical Engineering, College of Engineering, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia

## ABSTRACT

Corrosion of magnesium (Mg) is generally manifested by cathodic hydrogen gas evolution and concomitant anodic Mg dissolution. The surface condition significantly modified the corrosion of Mg, especially related to the deformation. The corrosion behaviour of AZ31 Mg alloy with emphasis on surface condition effect has been investigated. Filiform-like corrosion was observed significantly along the grinding path due to surface modification by mechanical grinding. From the cross-section characterization, the corrosion attack into the crystallographic structure. The analysis of corrosion behaviour is based on the polarization behaviour during the electrochemical measurement and scanning vibration electrode technique (SVET) measurement for local electrochemical quantification. Cathodic filiform body with Mg (OH)<sub>2</sub> formation promoted the anodic corrosion propagation. Thick non-protective corrosion product formed after a longer immersion period was associated with uniform pitting propagation tunneled underneath the alloy, confirming the autocatalytic cathodic activation.

**KEYWORDS:** Corrosion, Magnesium, Surface condition, Filiform, Mechanical grinding

**DOI:** <https://doi.org/10.1016/j.matpr.2021.02.213>

## **ACKNOWLEDGEMENTS**

The authors wish to acknowledge the financial support of Ministry of Higher Education, Malaysia (FRGS/1/2019/TK05/UMP/02/5) and RDU1901128 and Universiti Malaysia Pahang, Malaysia (RDU180333) research grants.