Mol, Arjan

Associate professor

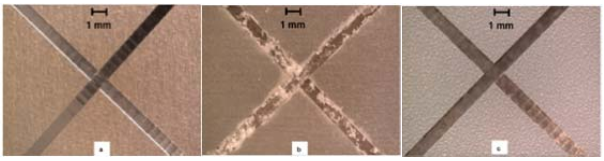
Tel: +31 15 2786778
E-mail: J.M.C.Mol@tudelft.nl
Website: www.tudelft.nl

Research interests:
(Local) Corrosion
Electrochemistry
Corrosion Protection
Surface Treatments
Corrosion Protective Coatings
Corrosion Inhibitors
Interfacial bonding and (de)adhesion

Corrosion Protection and Surface Treatments

Recent Research activities:

Eco-friendly Li-based Inhibitor Technology for Corrosion Protective Coatings

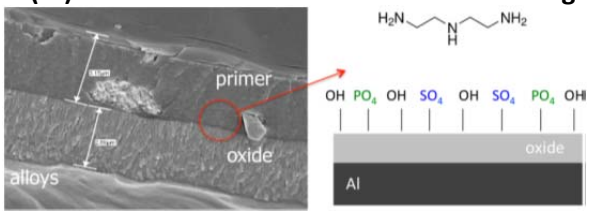


(a) (b) (c)

Visual appearance of AA2024-T3 (a) before and (b) for uninhibited coating and (c) Li-based inhibitor doped coating after 168 hours Neutral Salt Spray Exposure (ASTM B-117)

Our recent work demonstrated that Li-inhibited epoxy primers provide excellent corrosion protection to aluminium alloys. Microscopic and advanced analytical studies elucidated the chemical composition and morphology of this layer while accelerated exposure tests and electrochemical analysis confirmed the unique corrosion protective properties.

Cr(VI)-free Anodization and Interfacial Bonding

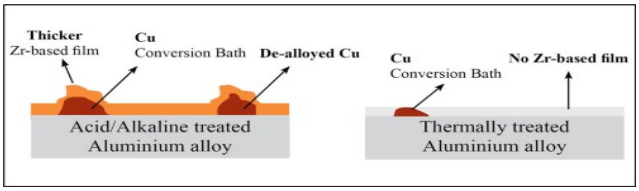


Cross-sectional and schematic view of the metal-oxide-primer interface

In the transition to environmental friendly pretreatment of aerospace aluminum alloys, chromic acid anodizing (CAA) is being replaced by sulfuric acid (SAA), phosphoric acid (PAA), or phosphoric-sulfuric acid (PSA) anodizing. Our studies have shown the pivotal importance of the oxide surface chemistry (such as hydroxyl fraction) for subsequent adhesion or coating processes, in addition to that of the surface morphology.

Effect of Surface Chemistry on the Local Composition of Zr-based Conversion Coatings

The application of ultra-thin conversion films on metallic substrates is commonly used to improve the corrosion resistance of the metal surface and also the adhesion performance of subsequently applied organic coatings. Our studies have shown that the surface chemistry prior to conversion coating has a major influence on the final quality and functionality of the conversion coating.



The surface chemistry of metal (oxides) highly influence the deposition mechanism and kinetics of Zr-based conversion coatings

The findings are highly relevant for industrial treatments of aluminium and (galvanized) steel surfaces, especially for those that undergo corrosion protection and painting process steps prior to usage.

Key publications:

- P. Taheri, H. Terryn, J.M.C. Mol (2015). Studying interfacial bonding at buried polymer-zinc interfaces. *Progress in Organic Coatings, 89*, 323-331..
- P. Visser, Y. Liu, X. Zhou, T. Hashimoto, G.E. Thompson, S.B. Lyon, L.G.J. van der Ven, J.M.C. Mol, H. Terryn (2015). The corrosion protection of AA2024-T3 aluminium alloy by leaching of lithium-containing salts from organic coatings. *Faraday Discussions, 180*, 511-526.
- J.H.O.J. Wijenberg, M. Steegh, M.P. Aarnts, K.R. Lammers, J.M.C. Mol (2015). Electrodeposition of mixed chromium metal-carbide-oxide coatings from a trivalent chromium-formate electrolyte without a buffering agent. *Electrochimica Acta, 173*, 819-826.
- S.T. Abrahami, T. Hauffman, J.M.M. de Kok, J.M.C. Mol, H. Terryn (2015). XPS analysis of the surface chemistry and interfacial bonding of barrier-type Cr(VI)-free anodic oxides. *The Journal of Physical Chemistry C, 119*, 19967-19975.
- P. Taheri, H. Terryn, J.M.C. Mol, JMC (2015). An in situ study of amine and amide molecular interaction on Fe surfaces. *Applied Surface Science, 354*, 242-249.