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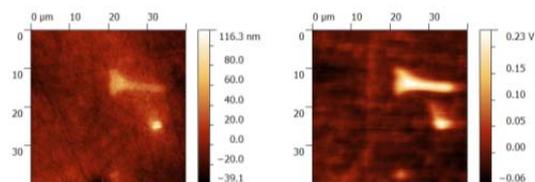
Research interests:

local corrosion electrochemistry
microelectrochemical methods
corrosion protection

Local Corrosion and Electrochemistry

Recent Research activities:

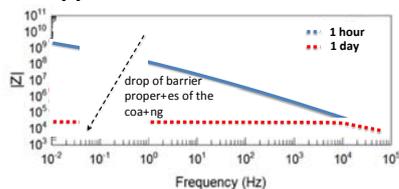
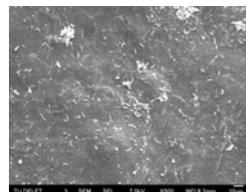
Understanding the influence of microstructural features in initial stages of corrosion



Example of AlCuFeMnSi intermetallic particle in AA2024 alloy, (right) AFM-topography map (left) surface potential map (SKPFM) of the particle, showing a more noble potential with respect to the surrounding Al-matrix

This research line focuses on helping to understand why a particular metal is susceptible to corrosion attack and the relation with its microstructure. The main objective is to implement and explore new experimental routes that can provide more understanding of localized corrosion mechanisms, as well as the triggering factor(s) involved in its initiation.

Microbiologically influenced corrosion (MIC) study on (coated)-metal for marine applications



(left) SEM image of coating surface after few hours immersion in seawater. Initial formation of biofilm is observed, (right) Example of EIS measurement showing the decrease of barrier properties of the coating due to biofilm formation and microbiological activity

Combining (micro-) electrochemical characterization and microscopic analysis we focus on studying the degradation of the coated metals upon exposure to natural seawater. The microbiological activity has an important impact on the barrier properties of the organic coatings. It can lead to early delamination of the system and consequently corrosion of the metal underneath.

Influence of cyclic loading on the corrosion behaviour of coated-metal systems

Commonly, metallic structures are protected against corrosion by an organic coating. Structures are often under cyclic-stresses that on the long-term may affect the mechanical properties of the system. We combine cyclic loading-tests with (in-situ) electrochemical characterization to study the fatigue failure of the coating. An early failure of this layer will compromise the service life of the metal.

Local electrochemical methods

Expertise on localised techniques such as Scanning Electrochemical Microscope (SECM), Scanning Vibrating Electrode Technique (SVET), electrochemical micro-capillary cell and Kelvin-probe Atomic Force Microscope (SKPFM).

Key publications:

- I. Recloux, Y. Gonzalez-Garcia, M. Mouanga, F. Khelifa, J.M.C. Mol, M.-G. Olivier. Active and passive corrosion protection of AA2024-T3 by an hybrid inhibitor doped mesoporous sol-gel and top coating system. *Surface and Coatings Technology*, in press <http://dx.doi.org/10.1016/j.surfcoat.2015.11.002>
- E. Martinez-Lombardia, Y. Gonzalez-Garcia, L. Lapeire, I. De Graeve, K. Verbeken, L. Kestens, J.M.C Mol, H. Terryn. Scanning Electrochemical Microscopy to study the effect of crystallographic orientation on the electrochemical activity of pure copper. *Electrochimica Acta*, 116 (2014) 89-96
- L.C. Abodi, Y. Gonzalez-Garcia, O. Dolgikh, C. Dan, D. Deconinck. J.M.C. Mol, H. Terryn, J. Deconinck. Simulated and measured response of oxygen SECM-measurements in presence of a corrosion process. *Electrochimica Acta*, 146 (2014) 556-563
- Alvarez-Pampliega, Y. Gonzalez-Garcia, K. Van den Bergh, J. De Strycker, H. Terryn. Scanning Kelvin Force microscopy study at the cut-edge of aluminum rich metal-coated steel. *Materials and Corrosion*, 66 (2015) 16-22

