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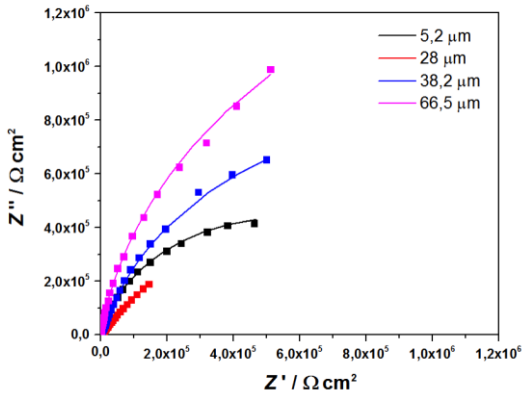
**Research interests:**
(Localised) Corrosion
Micro-electrochemical techniques
Microstructure-Corrosion relation of steels

## The effect of microstructure on (localised) corrosion of steels (MICROCORR)

Recent Research activities:

### Role of prior austenite grain size (PAGS) on passive film properties of martensitic steels

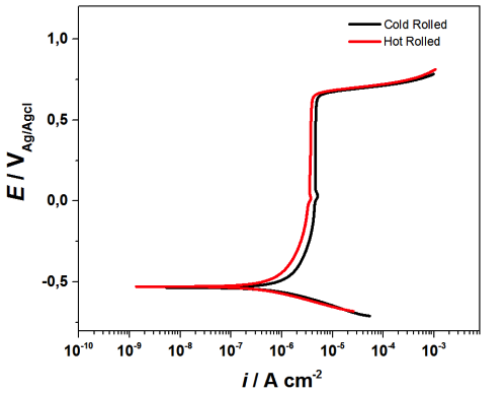
In this work, the effect of PAGS on passive film properties of martensitic steels has been investigated in alkaline environment. Since microstructural features have a synergistic effect on passive layer properties, fully martensitic steels with different PAGS alloys but same chemical composition and similar dislocation density were modelled. Electrochemical measurements (potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), Mott-Schottky analysis) and surface characterization (XPS) showed that refinement in PAGS have a detrimental effect on passive layer properties up to a critical PAGS. However, further refinement below the critical value leads to improvement in passive layer properties due to dominant effect of changes within the complex martensite structure.




Nyquist plot (EIS) after potentiostatic polarization at 0.4 $V_{Ag/AgCl}$ for 6 hours. The semi-circle size indicates the charge transfer resistance that decreases with PAGS refinement up to a critical value while further refinement leads to an increase

### Effect of dislocation density on passive layer properties of IF ferritic steels in alkaline environment

Although reasonable numbers of studies have revealed insights of dislocation density into mechanical properties of steels, there is no consistency in literature on its effect on passive layer properties. This work investigates the role of dislocation density on passive layer properties. The electrochemical and surface characterization measurements show that increase in dislocation density leads to formation of thicker but more defective passive layer with less $Fe_2O_3$ amount.




Potentiodynamic polarization curves of cold rolled and hot rolled IF steels, showing slightly higher passivity current density with increase in dislocation

**Publications**

*A.Yilmaz, X.Li, S. Pletincx, T. Hauffman, J.Sietsma, Y. Gonzalez-Garcia* 'Role of prior austenite grain size on passive film properties of martensitic steels' (In preparation)