



A journey through electrochemical techniques to describe passivity and passivity breakdown

Lecturer

Dr. Vincent Vivier is currently senior researcher in CNRS at Sorbonne Université (Paris – France) at the LISE laboratory. He obtained a PhD in electrochemistry in 2000 from the Université of Paris Val-de-Marne and joined the LISE laboratory as researcher in 2002. His research focuses on the electrochemical characterization of the aging of materials. Vincent Vivier maintains strong collaborative links with several academic groups in France and abroad. He is Adjunct Professor at the Beijing University of Chemical Technology, (Beijing, China) since 2018. He is a member of the Editorial Board of ChemElectroChem and of the Advisory Board of Electrochimica Acta and he has also been involved in the organisation of national and international conferences. He was awarded the Bronze medal of the CNRS (2007) and published over 175 publications in peer-reviewed journals, 14 book chapters and 1 patent.

Abstract

Electrochemical techniques are widely used for studying corrosion since they provide a unique way to sense material degradation *operando*. In the case of highly reactive materials, such as magnesium, the combination of electrochemical impedance spectroscopy (EIS) and scanning electrochemical microscopy (SECM) has allowed to devise the reaction mechanism of dissolution. Indeed, EIS enables the determination of thin film properties, whereas SECM is used to characterize the evolution of the active surface area. For passive materials such as stainless steel, the dissolution can be very low due to the protectiveness of the thin oxide film formed at the surface. Interestingly, in presence of aggressive ions such as halides, the oxide film can be locally broken. These behaviors can be sensed using EIS for the global characterization of the passive film, whereas the local breakdown of passive films can be initiated using SECM technique. At the end, pitting corrosion which is a stochastic phenomenon can be studied by working on single event.

In this presentation we will show, based on the results obtained in our group on different materials, how we can implement electrochemical techniques in order to establish their corrosion mechanisms.