



Flavien Vucko

Institut de la Corrosion, Brest/France & RISE Research Institutes of Sweden, Materials and Production, Corrosion Department, Kista/Sweden

Tuesday, 5th December 2023, 16:00 s.t.

TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B



The seminar will be also held as a zoom Meeting

<https://tuwien.zoom.us/j/63292029298?pwd=bHZPWU1PaXI3dmgzd3VHRDM2TDR5UT09>

Meeting ID: 632 9202 9298

Password: uD68jKJN

Scanning Kelvin Probe technique to investigate hydrogen uptake under atmospheric corrosion conditions

During service life, vehicles can be exposed to severe corrosive conditions, particularly in the presence of different salts. Corrosion of steel and its metallic protective coating can lead to hydrogen uptake into the steel, which can induce hydrogen embrittlement, particularly in high strength steels. Historically, the permeation method was used to evaluate the hydrogen flux under cathodic charging conditions in a solution. This method was extended to investigate the hydrogen permeation under atmospheric corrosion conditions too. The main advantage of the permeation is its capability to detect and quantify very low hydrogen fluxes. However, the drawback is the absence of lateral resolution, which leads to an averaging of the hydrogen flux from the process area. One alternative under atmospheric conditions is the use of the Scanning Kelvin Probe (SKP) that shows some lateral resolution. SKP technique is a method allowing to measure the Volta potential difference between two metallic electrodes (e.g. a sample and the SKP probe, separated by an air gap or an insulator such as an organic coating). In presence of hydrogen, change in the Volta potential can be observed related to the distribution of hydrogen close to the steel surface, which depends particularly on microstructure, hydrogen traps and stress.

The mechanism of hydrogen detection in high strength steel using SKP is detailed based on a combination of SKP and XPS analyses. Then, the procedure for the calibration of the SKP measurement to quantify the local hydrogen flux is presented. Some results of hydrogen uptake under atmospheric corrosion conditions are compared to the literature data.

Flavien Vucko has been working at the French Corrosion Institute, subsidiary of RISE Research Institutes of Sweden, since 2013. He is responsible of research activities related to metal/hydrogen interaction, including stress corrosion cracking and hydrogen embrittlement. He is leading research projects in France and in Sweden in various fields including automotive, aerospace and energy industries.

All interested colleagues are welcome to this seminar lecture (45 min. presentation followed by discussion).

Friedrich Aumayr
(LVA-Leiter)

M. Valtiner
(Seminar Chair)