

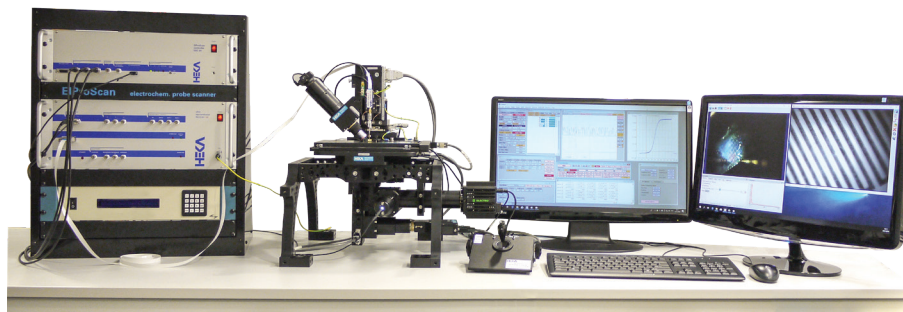


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EIProScan

FOR CORROSION SCIENCE

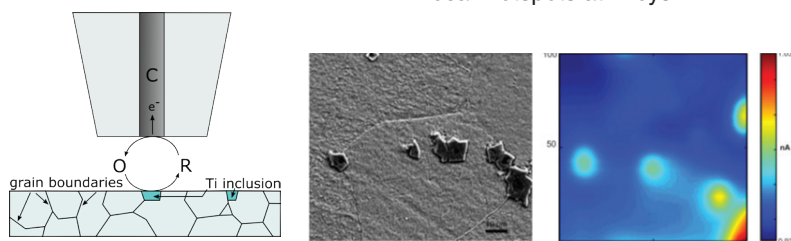
Scanning electrochemical microscopy (SECM) and related spatially-resolved techniques provide a powerful approach to gaining a deeper mechanistic understanding of localized degradation and corrosion processes.



Popular Techniques and Applications

- Detection of coating irregularities by localized impedance measurements.
- Study of corrosion kinetics by SECM

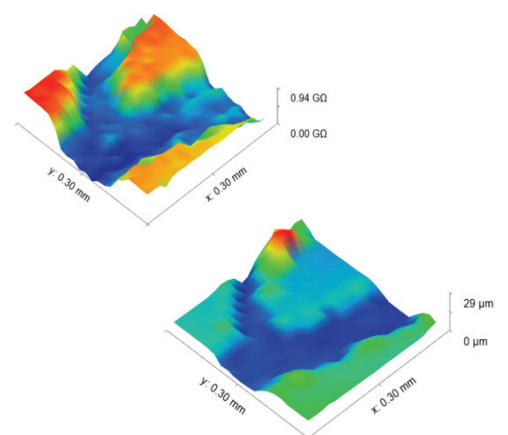
Local Hotspots at Alloys



Schematic representation of the experiment (left), scanning electron microscopy image (middle) and SECM map (right) of similar sites on the substrate. The local hotspots correspond to the conductive inclusions.

Gateman, S. M., Stephens, L. I., Perry, S. C., Lacasse, R., Schultz, R., & Mauzeroll, J. (2018) *npj Materials Degradation*, 2(1), 5.

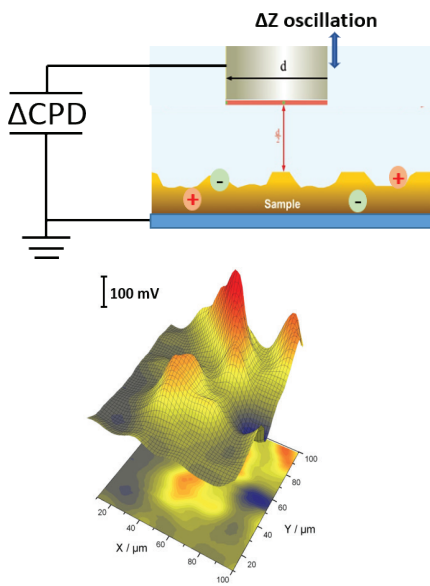
Local Impedance Mapping



Impedance mapping at 5 kHz (top) and simultaneously acquired topography map by shear force sensing (bottom). Scratches in the coating can be visualized.

Popular Techniques and Applications

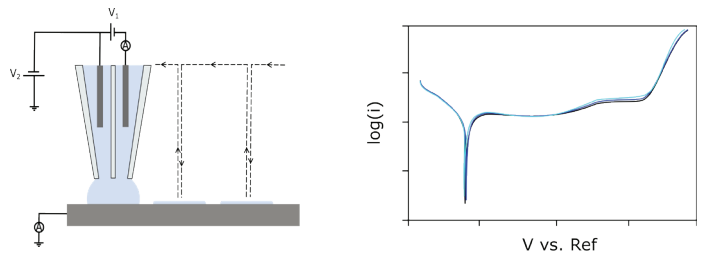
SKP on the Micron-Scale



Schematic representation of the work principle of SKP (top) and map of the contact potential difference of a materials surface (bottom).

- Measuring contact potential differences on the true micron-scale with scanning kelvin probe (SKP) measurements using micrometer-sized tips
- Mapping of local corrosion potentials, currents and localized Tafel plots with scanning electrochemical cell microscopy (SECCM)

Local Tafel Plots

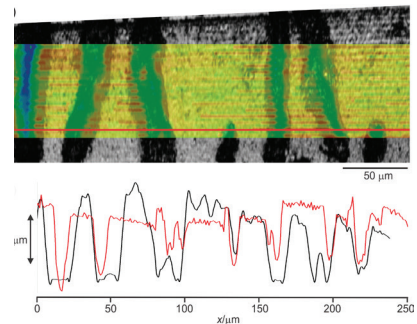
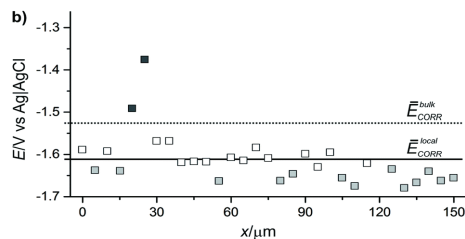
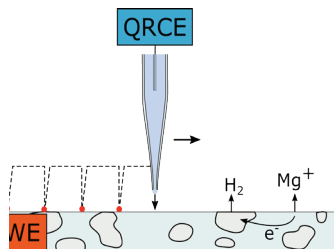


Schematic representation of the experiment (left). The droplet forms a miniaturized electrochemical cell which restricts common bulk electrochemical techniques to the micron-scale. Local Tafel plots can be recorded (right).

Yule, L. C., Bentley, C. L., West, G., Shollock, B. A., & Unwin, P. R. (2019) *Electrochimica Acta*, 298, 80-88.

- Constant-distance scanning with shear force sensing allows simultaneous mapping of sample topography and electrochemical activity

Local Corrosion Potentials at Alloys



Schematic representation of the experiment (left), profile of the local corrosion potentials (middle) and height profile of the corroded surface (right). Dauphin-Ducharme et al. *Faraday Discussion* 2015, 180, 331-345- Reproduced by permission of the Royal Society of Chemistry