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Novel double-barrel microelectrodes for simultaneous detection of Zn²⁺ and pH in SECM investigation of corrosion problems

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Zinc and magnesium are two of the most widely used metals in modern industries and for their important biological role they are of major interest of both chemists and life scientists. Magnesium and its alloys own a series of beneficial properties, such as low toxicity, high tensile strength-weight ratio. However, its applicability is severely limited by their poor corrosion resistance. On the other hand, the relative reactivity of magnesium and zinc makes these metals efficient anti-corrosion agents. The presentation is focused on the development of selective sensors in order to investigate the corrosion mechanism of magnesium and zinc in different samples.

A new double barrel type of ionselective microelectrode and dual potentiometric experiments has been introduced in Scanning Electrochemical Microscopy. Single and double-barrel microelectrodes were fabricated in a critical assessment of probe performance, namely pH sensitive antimony, Zn ion selective single-barrel microelectrodes, and Sb-Zn ISME double-barrel electrodes. The assessment showed that these microelectrodes are well-functioning devices. The calibration curves show Nernstian response in each case.

Local pH and zinc concentration changes were simultaneously detected using double-barrel antimony and Zn ISME electrodes in the real corroding system. Line scans were recorded over cut edge of organic coated, galvanized steel exposed to saline solution. The concentration profiles taken with the new double barrel ISME show great similarity comparing with the ones recorded with the single barrel ISME's. Results presented show promising perspective of the further application of the novel probes in scanning surface investigations.

Biography

Dániel Filotás has graduated with his master's degree in chemistry at the age of 23 years at the University of Pécs and started PhD studies in 2015. He was awarded the Fellowship granted by the Hungarian Republic twice, and for his Master Thesis written in English received the Award of Excellence by the Hungarian Chemical Society.

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