An Electrochemist's Approach to Generate, Characterize and Apply Micro- and Nanoscale Materials

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Electrochemistry is a well-established technique for the electrodeposition of thin films for corrosion protection or of advanced 3D structures for integrated circuit boards. It is also key to most approaches for sustainable energy conversion and it is widely utilized in sensors for the detection and quantification of ions and biomolecules. In this presentation novel concepts will be presented, adopting classical electrochemical methods to fabrication, characterization and utilization of functional materials at the micro- and nanoscale.

The fabrication of structured electrodeposits in the milli- and micrometer range by application of magnetic gradient fields will be used to demonstrate the concept of magnetic field-controlled mass transport in electrochemistry.[1] Furthermore electrochemistry will be highlighted as a powerful tool for the characterization of nanoparticles beyond conventional imaging methods using core/shell and alloy particles as an example.[2,3] Advancing from this, single nanoparticle electrochemistry will be introduced to study reactions of and at single nanoparticles directly in suspensions thereof. Applying single nanoparticle impact studies, otherwise inaccessible insights into nanoparticle reaction kinetics and electrocatalysis can be gained.[3,4]

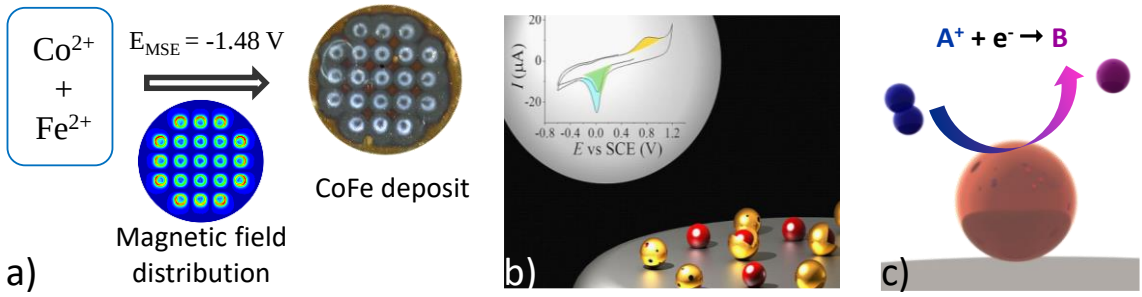

Fig. 1: New methods in electrochemistry: magnetic field controlled structuring of electrodeposits (a), electro-chemical characterization of multifunctional core shell nanoparticles (b) and single nanoparticle catalysis (c).

References:

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