

SEMINAR II

Thursday, 13.6.2024, 13:00, Kolar's Lecture Hall

Study of Electrochemical Nucleation and Growth Mechanisms of Silver using in-situ Liquid-Cell Transmission Electron Microscopy

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Electrochemical phase formation and growth occur when a solid phase forms from an electrolytic solution. These are very complex processes that are important in defining the shape and size of the nanomaterials and, therefore, their final properties. These processes have historically been understood only empirically. Although numerous fundamental studies have tried to tackle this problem, a detailed assessment of nucleation and growth mechanisms has yet to be explained. A direct visualization of these processes will help shed light on the details of such chemical and physical reactions. For this reason, in-situ microscopy techniques will play a vital role in deepening our understanding of electrochemical phase formation.

The in-situ Electrochemical Liquid-Cell Transmission Electron Microscopy (EC-LCTEM) is an important technique that provides direct access to a system's dynamic information with high spatial and temporal resolution. In this seminar, we will explore the intricacies of silver nanoparticle electrodeposition and electro-dissolution as a strategy to understand the initial stages of nanostructure nucleation and growth. For this approach, a particular liquid holder with electrochemistry capabilities was used. Therefore, we could simultaneously probe the dynamic response from the electrochemistry coupled with the reaction from the in-situ EC-LCTEM videos. Dynamic observation of silver response to potential was shown, with nucleation of nanoparticles and diffusion-limited growth, and faceted growth of these nanostructures was observed due to the imposition of different types of electrochemical signals.

Kindly invited.