

IPID4all Senior Research Exchange with Carl von Ossietzky University Oldenburg

Feedback report

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Exchange topic: In-situ electrochemical Atomic Force Microscopy

The goal of our joint project was to study the effects of the surface roughness and surface orientation of various Copper (Cu) substrates on the formation and growth process of Zinc (Zn) crystallites during the electrodeposition. The group of Prof. Dr. Renner has recently developed an in-situ electrochemical atomic force microscopy (AFM) to probe the changes in topography during electrochemical processes. This powerful technique should help us to better understand the electrodeposition of Zn on a polycrystalline Cu surface. Therefore, we performed numerous experiments where we modified the topographic features of Cu surfaces by using various etching protocols. The protocols ranged from acidic treatment like phosphoric acid to electrochemical etching by using cyclic voltammetry and chronoamperometry methods. The different etching process strongly affects the roughness and atomic arrangement of the Cu surface atoms. In the second step, we used a home-made electrochemical cell to electro-deposit Zn onto the various etched Cu surfaces. The acquisition parameters for the AFM images were optimized to monitor the time-resolved changes in topographic features resulting from the different stages of the electro-deposited Zn crystallites. The quick AFM measurements allowed us to follow the dynamic formation and growth of the Zn crystallites on various Cu surfaces. Based on these primarily work, we discussed the different possibilities for a fruitful cooperation and to further exchange our ideas.

Future/collaborations and outlook

Our primary experiments serve as a proof of concept and we are very satisfied about our first very promising results about the formation mechanism and growth process of Zn crystallites on various Cu surfaces. Now we are evaluating the data and performing further characterization of the various treated Cu substrates in Oldenburg as well as in Hasselt. In addition, a first manuscript draft is in progress and will be done in the next months. To continue with our fruitful collaboration, we are planning a regular exchange between our PhD students. For this purpose, a PhD student from the group of Prof. Renner will visit my lab for several weeks in summer 2018. In addition, we are searching for possible bilateral funding opportunities for our joint project.

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