



Physikalisches Kolloquium

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Challenges and solutions for electron microscopy and spectroscopy in the field of chemical energy conversion

Analytical transmission electron microscopy (TEM) has become a widely implemented technique in a modern research institute involved in catalysis and materials science which are key topics in the field of chemical energy conversion. To get the full picture when investigating different materials and their properties, several analytical techniques available in TEM have to be combined and compared with the results of other analytical instruments. However, usually TEM specialists perform the necessary tasks for a thorough microscopical study of the materials of interest. The need for generating standard procedures and workflows optimized for non-expert TEM users has been addressed in our ChemiTEM project. The developed workflows were implemented into a tablet app enabling non-expert TEM users to perform even applications they have no previous experience with by guiding them through all necessary decision processes. The app also includes a workflow for data analysis. All this renders the set of standardized workflows a versatile toolbox for TEM applications in material synthesis and chemistry. In many cases, samples have to be investigated under inert conditions, e.g., when catalysts consist of reduced metals. We developed a new method to perform such investigations without the necessity to use dedicated sample holders but instead being able to harness the capabilities of standard sample holders. I will present some examples of the interplay of different analytical techniques as well as results of the ChemiTEM project and our inert investigation techniques. In addition, a short outlook on the development of standardized workflows for electron energy-loss spectrometry (EELS) and X-ray photoelectron spectroscopy (XPS) will be given.

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