Correlative Microscopy: State-of-the-art Imaging Automation Combined with Artificial Intelligence for Efficient Workflows

S. Basu
Carl Zeiss Microscopy LLC., White Plains, NY 10601
sandip.basu@zeiss.com

In microscopy for materials research, imaging is often only the first step. The real value is in the data that the images provide. In this presentation, I will highlight our correlative microscopy software solutions that bridge the gap between different modes of microscopy, e.g., light and electron. The connected microscopy interface enables seamless sample transfer and automated measurements to collect maximum amount of relevant data with minimum effort. It offers user-friendly means to organize and align data and images from multiple modalities in a sample centric workspace.

Additionally, image segmentation and object classification are still a challenge in microscopy but simultaneously they are the foundation for all subsequent image analysis steps. Artificial intelligence (AI) is the means of choice to help automate workflows and to ensure that the results are reproducible, precise, and operator independent. Machine learning (ML)-based algorithms aim at workflow automation, gaining speed and guaranteeing reliability. The latest AI/ML technologies allow the examination of samples that have previously been impossible to analyze. For example, multiphase analysis, layer thickness measurements, or technical cleanliness analysis are applications that often require the use of AI powered solutions.

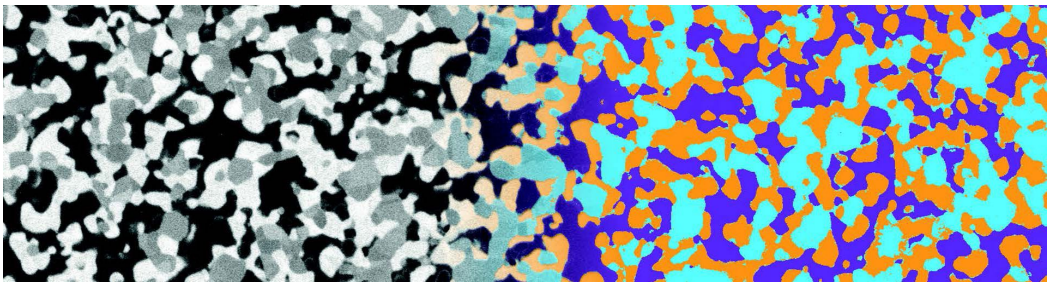

Figure 1: SEM cross-section image of a solid oxide fuel cell anode consisting of pores (black), a ceramic (gray) and a metallic (white) phase. Overlaid is the segmentation result by ZEISS ZEN Intellesis AI model (purple: pores, light blue: ceramic phase, orange: metallic phase). Note that the model was able to deal with the different gray levels of the ceramic phase.