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## Transmission electron microscopy – A versatile tool to study the microstructure of HT-PEMFC

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Different types of fuel cells exist which produce electricity in an environmentally friendly way. High-temperature polymer electrolyte membrane fuel cells (HT-PEMFCs) are based on hybrid materials where inorganic metal oxides and or carbon support materials are combined with a proton conducting polymer. The microstructure, the phase distribution and the occurring interfaces are key parameters which determine the performance. Due to the size of the individual grains and catalyst particles, high spatial resolution techniques are required to characterize the constituting materials in detail. In our work we analyze them in depth by different transmission electron microscopy (TEM) techniques, considering not only their atomic structure but also the elemental distribution and oxidation states of the individual atoms. The TEM measurements are also done on the polymer which is sensitive to electron beam bombardment. Investigations on polybenzimidazole (PBI)-based membranes containing inorganic fillers revealed that the nanoparticles are homogenously distributed and consist of amorphous silica. A segregation of P or Cl to the particle – PBI interface was not detected. With the insights obtained by TEM we were able to explain the properties. We also analyzed HT-PEMFCs containing tungsten oxide support materials after different operation times and modes including start-stop-cycles and identified different degradation phenomena and the corresponding microstructural changes.

### Biography

Christina Scheu has a diploma degree in Physics and did her Doctorate in 1996 at the Max-Planck-Institute for Metals Research in Stuttgart (Germany) in the field of material science. In 2008, she was appointed as a Full Professor at the Ludwig-Maximilian-University (Munich, Germany). Since April 2014, she holds a joint position as an Independent Group Leader at the Max-Planck-Institut für Eisenforschung GmbH (MPIE) in Düsseldorf and as a Full Professor at the RWTH Aachen, Germany. She has more than 170 publications in journals and conference proceedings.

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