Micro- and nanostructure analysis of polymer electrolyte membrane fuel cells

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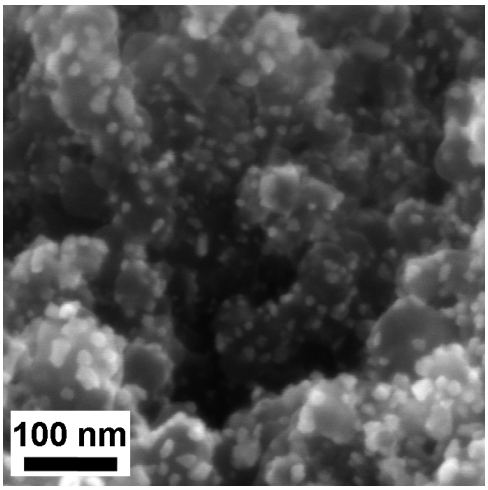
Fuel cells are expected to play a major role in the future energy supply and in this context polymer electrolyte membrane (PEM) fuel cells are promising candidates not only in the automotive sector.
Under real-world conditions and especially using lower noble metal loadings for the catalyst layer, fuel cell degradation is still an important issue. This degradation was investigated by directly imaging the catalyst particles using scanning and transmission electron microscopy. This allowed e.g. an assessment of the impact of carbon monoxide poisoning on degradation and thereby of the acceptable CO concentration in hydrogen fuel.
Additionally, x-ray computed tomography was applied to acquire quantitative 3D micro-structural data of fuel cell components. In addition to the direct insight into the complex multi-scale structure, physical properties of fuel cell components were calculated numerically based on these 3D datasets contributing to an improved understanding of the relationship between fuel cell design and performance.



Scanning electron micrograph of carbon-supported PEM fuel cell catalyst particles.