ANNOUNCEMENT

UNIVERSITÄT SALZBURG

Vortragsankündigung

Mittwoch, 31. Jänner 2018, 17:00 s.t.

Seminarraum I (JAK2AOG1.33), Jakob-Haringer-Straße 2a

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Carbides and Oxycarbides – Formation, Properties & Application in Electrocatalysis

The complete oxidation of ethanol to CO_2 (electro oxidation of ethanol, EOR) is one of the main challenges in Direct Ethanol Fuel Cells. Titanium oxycarbide (TiOC) is investigated as innovative support for Pt based nanoparticles during the EOR. The chemical composition of the TiOC surface is characterized in-situ during its conversion from TiO_2 to $TiO_{0.5}C_{0.5}$ using X-ray photoelectron spectroscopy (XPS). For this, a surface science approach is followed to test the influence of exposure to air and oxygen on the chemical composition of the surface. An operando study of the conversion procedure is conducted under UHV conditions which revealed that TiOC is thermodynamically less stable than anatase TiO_2 and carbon, and that it therefore always decomposes at the surface. This decomposition and the formation of a TiO_2 surface film upon exposure to ambient air protect the material from further oxidation when it is used in an electrochemical environment, without majorly influencing its electronic conductivity. To understand the role of TiOC as catalyst support, its surface chemistry is monitored during the EOR using ex-situ emersion XPS in combination with electrochemistry, where the electrochemical cell is directly connected to the XPS. The activity of the catalysts is determined in acidic electrolytes with ethanol concentrations varying from 0.1 to 1 M. For a quantitative evaluation of the EOR products, differential electrochemical mass spectrometry (DEMS) is employed. The results show that Pt/TiOC is less prone to poisoning than Pt/C which is most likely due to a stronger interaction of TiOC with ethanol, when compared to carbon.