In-situ FTIR and X-ray Absorption Spectroscopy of Operating Hydrogen/Air and Direct Methanol Fuel Cell Nanostructured Anode Catalysts

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The anode catalytic surfaces of fuel cell membrane electrode assemblies are studied in fully operating fuel cells by a FTIR and X-ray absorption spectroscopy. This is the first report of a fully operating liquid feed DMFC studied at the Advanced Photon Source at Argonne National Laboratories.

The near edge data and EXAFS data are analyzed as a function of potential. In the case of reformate fuel cells, the PtRu catalysts is essentially all metallic. In the case of the liquid feed direct methanol fuel cell, the best fit of the near edge data using principal component analysis shows that the incorporation of some oxide provides the best fit.

The FTIR data suggests that the anode PtRu catalyst is a mixed phase catalyst with Ru somewhat phased out of the fcc PtRu lattice.

In addition to analysis of the data, the detail of cell design for in-situ FTIR and in-situ synchrotron studies of fuel cells will be discussed.