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In situ XAS of Pt monolayer model fuel cell catalysts: balance of na-nostructure and bimetallic interactions[1]

DANIEL FRIEBEL, SLAC National Accelerator Laboratory, VENKAT VISWANATHAN, SUNCAT Center for Interface Science and Catalysis, ASK LARSEN, CAMD, Technical University of Denmark, DANIEL J. MILLER, HIROHITO OGASAWARA, SLAC National Accelerator Laboratory, TOYLI ANNIYEV, None, CHRISTOPHER P. O'GRADY, JENS NØRSKOV, SUNCAT Center for Interface Science and Catalysis, ANDERS NILSSON, SLAC National Accelerator Laboratory — The mechanism of the electrochemical oxygen reduction reaction (ORR) has been well understood based on DFT calculations, but there has been a lack of supporting experimental data, due to the difficulties of probing the electrocatalyst surface in situ. Our new approach using Pt monolayer model catalysts provides true surface sensitivity for - originally bulk sensitive - x-ray absorption spectroscopy (XAS) and, owing to the high resolution of the Bragg analyzer at SSRL beamline 6-2, allows for in situ detection of chemisorbed O and OH, whose stability can be used as a descriptor in predicting the activity of new ORR catalyst materials. Our ability to control the growth mode in the Pt/Rh(111) model system allows us to generate Pt nanostructures with highly different O affinities from identical starting materials.

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