

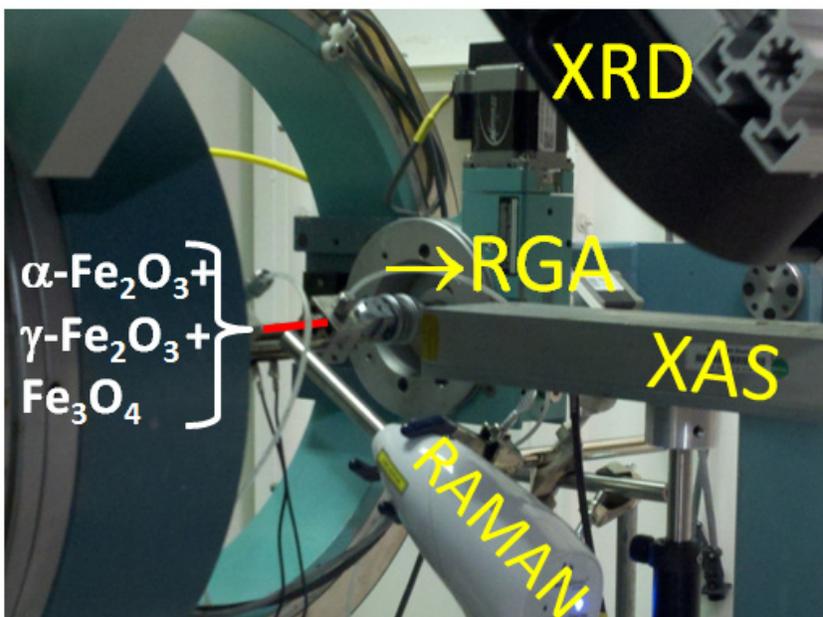
Application of operando XAS, XRD and Raman Spectroscopy for phase speciation in water gas shift reaction catalysts

The structural and compositional changes of the partially reduced iron oxide Fe_2O_3 and 3% chromium oxide-modified iron oxide ($3\% \text{Cr}_2\text{O}_3 / \text{Fe}_2\text{O}_3$) catalysts before, during and after the water gas shift (WGS) reaction are reported. The measurements were performed by collecting X-ray Absorption Fine structure, X-ray Diffraction and Raman spectroscopy data on the catalysts, and the mass spectrometry data of reactants and products, all done in a single experiment. These materials demonstrated marked structural disorder and compositional heterogeneity that are peaked in their catalytically active states. The main findings revealed in the result of combining multiple techniques include: the role of Cr in stabilizing the low temperature $\gamma\text{-Fe}_2\text{O}_3$ phase, the nature of the disordered phase in the active state of the catalysts and the possible deactivation mechanism.

A. Patlolla, E. V. Carino, S. Ehrlich, E. Stavitski, A. I. Frenkel

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Operando studies of the Water-Gas Shift catalyst