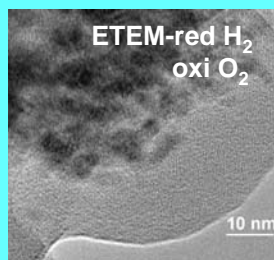
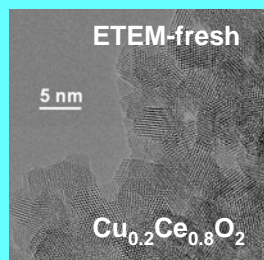
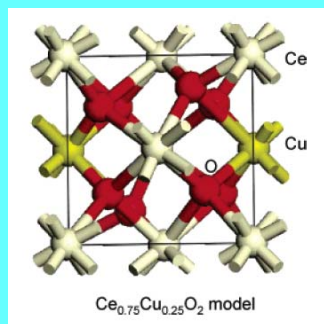


“Morphological and Structural Changes during the Reduction and Reoxidation of CuO/CeO<sub>2</sub> and Ce<sub>1-x</sub>Cu<sub>x</sub>O<sub>2</sub> Nanocatalysts: *In-situ* Studies with Environmental TEM, XAS and XRD”, J. Ciston, R. Si, J.A. Rodriguez, J.C. Hanson, A. Martínez-Arias, M. Fernandez-García, and Y. Zhu, *J. Phys. Chem. C*, 115 (2011) 13851-13859.

The structural, morphological and electronic properties of Ce<sub>1-x</sub>Cu<sub>x</sub>O<sub>2</sub> nanocatalysts highly active for the water-gas shift and CO oxidation reactions were examined during reduction/oxidation cycles using H<sub>2</sub> and O<sub>2</sub> as chemical probes. Time-resolved *in-situ* characterization was performed by XAS as well as aberration-corrected Environmental TEM. It was found that the nanocatalysts reduced to a Cu/CeO<sub>2</sub> biphasic system with significant oxygen vacancies in CeO<sub>2</sub>. The Cu precipitated from the Ce<sub>0.8</sub>Cu<sub>0.2</sub>O<sub>2</sub> solid solution neither oxidized to form CuO, nor fully returned to a bulk Ce<sub>0.8</sub>Cu<sub>0.2</sub>O<sub>2</sub> phase in solid solution. We found that ~ 50% of the Cu returned to a Ce<sub>1-x</sub>Cu<sub>x</sub>O<sub>2</sub> solid solution, while the remainder was observed by *in-situ* ETEM and XAS to form an amorphous copper oxide phase with a Cu oxidation state similar to Ce<sub>1-x</sub>Cu<sub>x</sub>O<sub>2</sub>, but with a local bonding environment similar to CuO. The behavior of the reduced Ce<sub>0.8</sub>Cu<sub>0.2</sub>O<sub>2</sub> reflects strong interactions between Cu and the ceria matrix and illustrates the advantages of working with solid solutions of mixed metal oxides.



### Cu K-edge: Reduction (top) and reoxidation (bottom) of Ce<sub>0.8</sub>Cu<sub>0.2</sub>O<sub>2</sub>

