PGM-substituted complex oxides for selective hydrocarbon transformations

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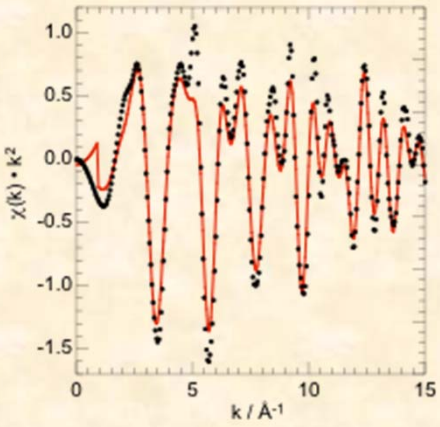
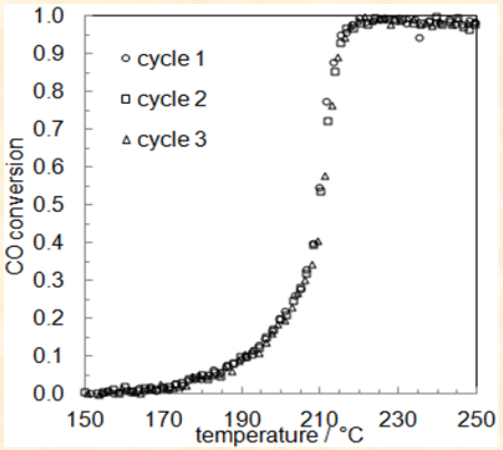
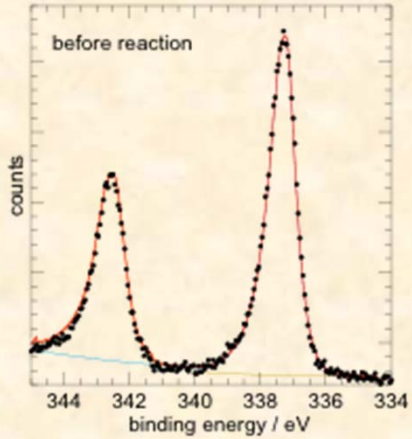
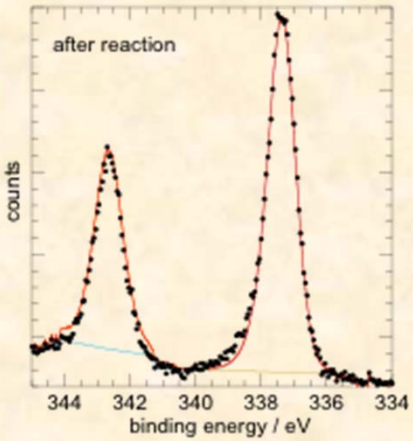
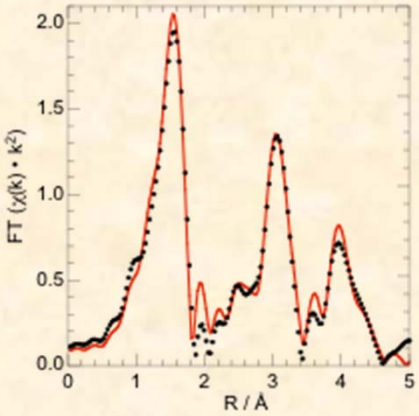


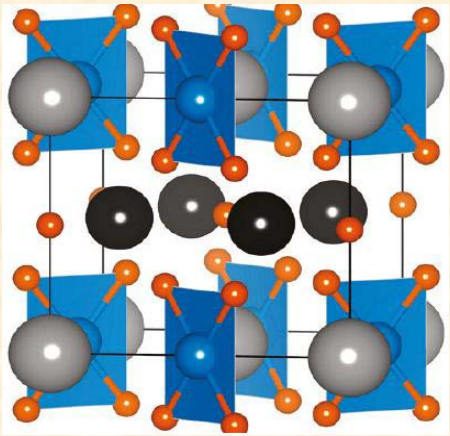
A family of Pd-containing complex oxides, Ln_2BaPdO_5 (Ln = La, Nd, Gd, Dy), was prepared and structurally characterized by powder X-ray diffraction and X-ray absorption spectroscopy. Pd(II) is incorporated into the structure as regular, PdO_4 square planes.











$$CO + 0.5\ O_2 \xrightarrow{Nd_2BaPdO_5} CO_2$$

Despite their low surface areas, these materials are remarkably good oxidation catalysts. The oxide host stabilizes Pd(II) so well that there is no observable change in the state of near-surface Pd after reaction by XPS, and the lightoff profiles are so reproducible that kinetic parameters can be extracted from non-isothermal curvefitting.