Electroceramic Materials for High-Purity Hydrogen Extraction from Liquid Hydrocarbon Fuels: Fundamental Investigations of Coupled Electrochemical and Catalytic Phenomena

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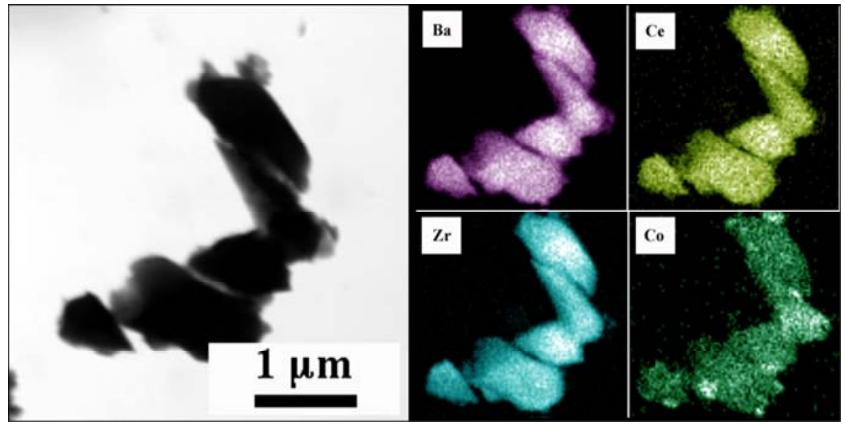
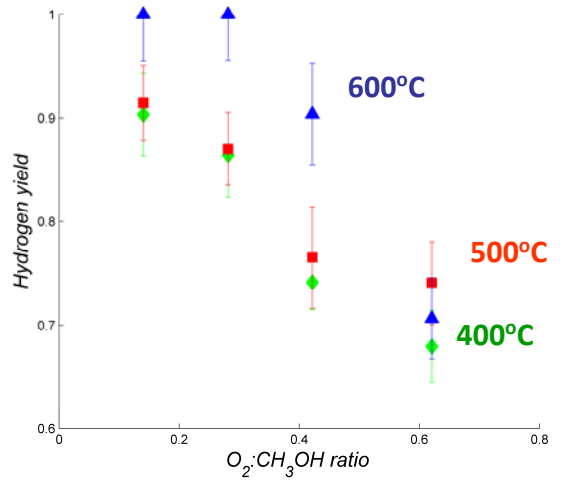
Summary
Cobalt-doped barium cerate-zirconate perovskites displaying both catalytic and mixed-conducting properties for high-purity hydrogen extraction from methanol have been synthesized and analyzed to verify crystal phase, structure, surface morphology and composition. Catalytic activity of resulting electroceramic for oxidative reforming of methanol has been investigated, and on-going impedance-spectroscopy analysis have made strides in quantifying both ionic and electronic conductivities of the material. These findings support continued investigations of *coupled catalytic hydrogen production and electrochemical purification* using these novel materials.



Processing yields homogeneous $BaCe_{0.24}Zr_{0.5}Co_{0.14}O_{3+\alpha}$, as verified by ICP, XRD, STEM & XDS.

Yields for methanol partial oxidation approach 100% for hydrogen production.



Impedence Spectroscopy at 600°C suggests mixed ionic-electronic conductivity for hydrogen separation