Proton-conducting solid oxide fuel cells
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Secondary battery is a possible device to level off renewable power generation, but it is expensive and a finite battery capacity is problem. However, if we utilize hydrogen fuel as a storing medium, huge electricity can be stored. Fuel cells are one of the most developed devices for the conversion from fuel to electricity and vice versa. Among them, fuel cells using proton conducting ceramics as electrolytes, PCFC(protonic ceramic fuel cells), have some advantages over those using oxide ion conductors: lower operation temperature, high fuel utilization in fuel cells, and hydrogen generation with proton extraction reaction from steam in water electrolysis. Our group is focusing on trivalent cation – doped barium zirconate(doped BZ) and working on many aspects of this materials. In this seminar, I introduce some of our recent achievements about (1) dopant selection and transport properties of various doped BZs, (2) mechanism of lower conductivity of BaO-deficient doped BZ, and (3) fuel cell demonstration of PCFC with electroleess-plated BZY(Y · doped BZ). As a conclusion, yttrium is recommended to be best dopant in the view of conductivity and protonic transport number in oxygen atmosphere.

Please find detailed explanation in following papers.

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