Supplementary Material (ESI) for Chemical Communications

An integral proton conducting SOFC for simultaneous production of ethylene and power from ethane

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Supporting information

Experimental

$BaCe_{0.85}Y_{0.1}Nd_{0.05}O_{3-\delta}$ precursors were prepared using a citrate-nitrate combustion method. Stoichiometric amounts of $Ba(NO_3)_2$, $Ce(NO_3)_3.6H_2O$, $Y(NO_3)_3.6H_2O$ and $Nd(NO_3)_3.6H_2O$ were first dissolved into de-ionized water. Subsequently, citric acid was added as chelating agent and NH_4NO_3 as oxidant to form a solution in which the citric acid/total metal/ NH_4NO_3 molar ratio was 1.5: 1: 3. Finally, the resulting solution was adjusted to about pH 8 by addition of NH_4OH. The resulting mixture was heated on a hot plate until it formed a foam and then ignited.

The phase structures of materials were identified using a Rigaku Rotaflex X-ray diffractometer (XRD) with Co Kα radiation. The shape and particle size of BCYN precursor powders were determined using a Philips Morgagni 268 transmission electron microscope (TEM). The morphology and metal concentration of BCYN membrane were determined using a Hitachi S-2700 scanning electron microscope (SEM) with energy dispersive X-ray spectroscope (EDS).

The fuel cell was set up by placing the MEA between concentric pairs of alumina tubes and sealed in a tubular furnace. All electrochemical tests were conducted using a Solartron 1287 electrochemical interface together with 1255B frequency response analysis instrumentation. The outlet gases from the anode chamber were analyzed

using a Hewlett-Packard model HP5890 GC.

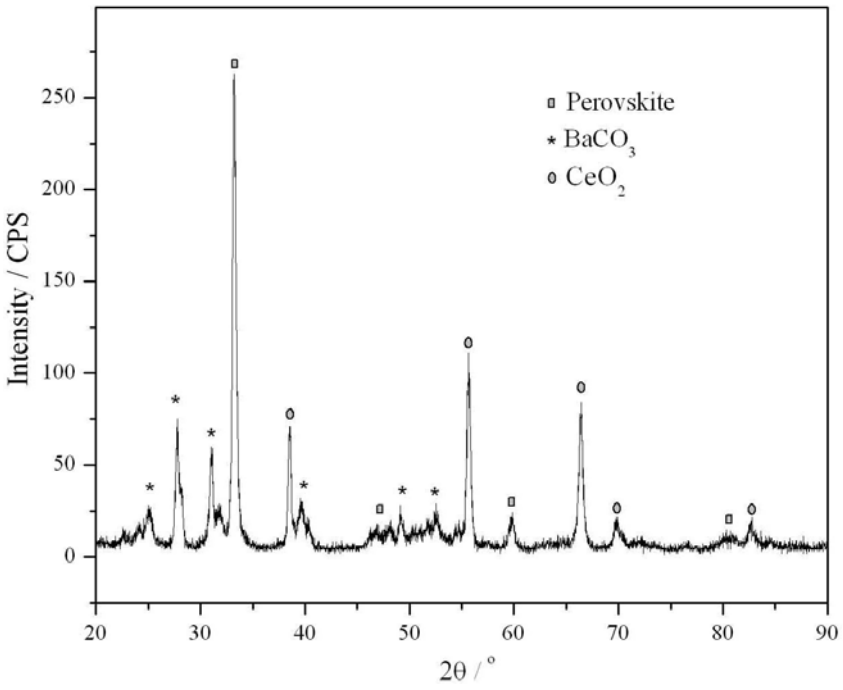

Fig. S1. XRD pattern of BCYN precursor.

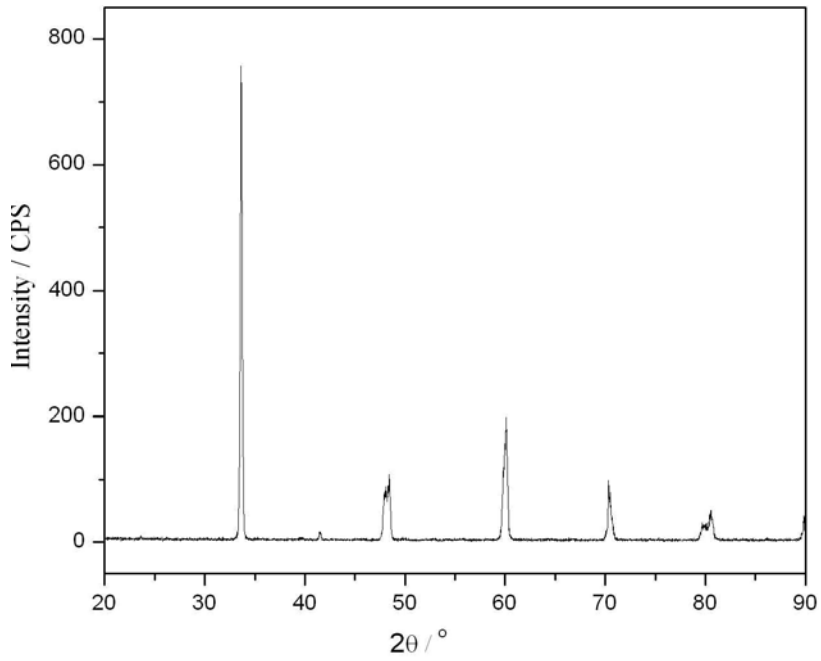

Fig. S2. XRD pattern of tri-layered BCYN membrane after sintering.