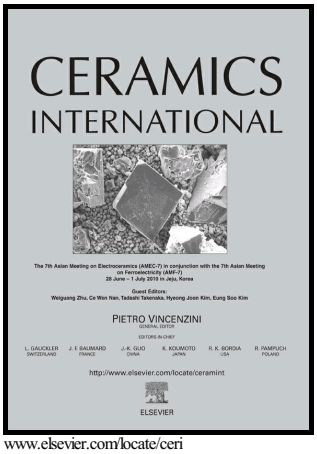

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Proton conducting solid oxide fuel cells with chemically stable $BaZr_{0.75}Y_{0.2}Pr_{0.05}O_{3-\delta}$ electrolyte

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Abstract

A $BaZrO_3$-based electrolyte with low Pr-doping concentration is proposed as electrolyte for proton-conducting solid oxide fuel cells (SOFCs). The new material $BaZr_{0.75}Y_{0.2}Pr_{0.05}O_{3-\delta}$ (BZYP5) shows a good chemical stability against CO_2. In addition, the low doping concentration of Pr in $BaZrO_3$ improves the sinterability of $BaZrO_3$ and also allows its structure to remain stable even in the reducing atmosphere, which is critical for fuel cell applications. The cell with BZYP5 as electrolyte shows maximum power densities of 124, 70, and 43 mW cm^{-2} at 600, 550, and 500 °C, respectively, which are larger than that for the cell with conventional high Pr-doping $BaZrO_3$ electrolyte reported previously. Electrochemical analysis indicates that the BZYP5 electrolyte shows a good ionic conductivity. These results suggest that the low Pr-doping strategy presented in this study promotes the densification for $BaZrO_3$ and the good electrolyte conductivity of $BaZrO_3$ is maintained which could be the reason for the improved cell performance, suggesting BZYP5 is a promising electrolyte for proton-conducting SOFCs.