

Grain boundary engineering of low yttrium doped barium cerate through lithium sintering aid infiltration

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The development of efficient proton-conducting electrolytes is limited, in part, by strong grain-boundary (GB) blocking effects in acceptor-doped perovskites such as $\text{BaCe}_{1-x}\text{Y}_x\text{O}_{3-\delta}$ (BCY). In this work, we implement a grain-boundary engineering strategy to introduce controlled amounts of lithium nitrate at the BCY GB. The infiltration efficiency was evaluated using three different techniques: core-shell coating, cold sintering, and capillary infiltration. Because Li^+ solubility is limited in the perovskite lattice, it selectively segregates to the GBs after nitrate decomposition, thereby modifying the interfacial defect chemistry. In addition, lithium acts as a sintering aid. Using Electrochemical Impedance Spectroscopy (EIS) it was possible to observe the successful retention of Li in the GBs environment, after optimization of the sintering protocol. Several Li loadings ranging from 1 to 9 at. % were introduced to assess the tunability of the engineered GBs and its influence on the relative density and ionic conductivity of BCY. EIS in symmetrical cells reveals that Li-infiltrated samples exhibit a significant decrease in the activation energy (from 0.81 to 0.56 eV) associated with GBs conductivity increase. This mitigation of GB resistance opens new pathways for the design of high-performance ceramic electrolytes operating at intermediate temperatures.

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Invitation letter for visa

No

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