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ABSTRACT:

Tuning air/steam electrode for proton conducting oxide cells

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Solid oxide cells, consisting of solid oxide electrolytes and electrodes, play an important role in efficient energy conversion. Solid oxide fuel cells (SOFC) and steam electrolysis cells (SOEC) have been extensively studied and developed. A typical oxide ion-conducting zirconia electrolyte has been well-established and reliable. However, proton-conducting oxide is another option that can reduce the operating temperature and fuel utilization/concentration.

A challenge with proton-conducting cells is electronic leakage through the electrolyte caused by electron holes. Defects appear in oxidative gas atmospheres, making the positive-side air/steam electrodes key to controlling this phenomenon. In this paper, we discuss the impact of the positive electrode on electron leakage in proton-conducting cells and report that selecting appropriate materials and structures can reduce electron leakage.

Part of our recent research efforts has focused on investigating new electrode materials. Our results reveal the advantages of choosing redox-active cations for the *A*-site of the ABO_3 perovskite-type metal oxides. Another example is the effect of inserting electron-blocking layers, which can reduce electronic leakage.

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