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PROCEEDINGS

Impedance spectroscopy analysis of percolation of ions within alkali salt- solid electrolytes ceramic membranes

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Electrochemical impedance spectroscopy (EIS) analysis was applied to evaluate the carbon dioxide ionic conductivity at the interfaces of porous solid electrolytes impregnated with alkali salts. An impedance analyzer was connected to an alumina sample holder with gold electrodes and platinum terminal leads, inserted in a programmable tubular furnace. Ytria-stabilized zirconia, samaria- and gadolinia-doped ceria, tungsten-doped lanthanum molybdenum oxide porous solid electrolyte ceramic pellets were prepared by using either a polymer or graphite as thermally removed sacrificial pore formers. Molten eutectic compositions of sodium-potassium and/or lithium-sodium-potassium carbonates were impregnated into the porous solid electrolytes. The collected $[-Z''(f) \times Z'(f)]$ impedance data showed the evolution from oxygen ion conductivity to carbon dioxide ion conductivity when the temperature of the ceramic pellets reached the melting point of the carbonates. Endurance tests were performed to evaluate the lifespan of the composite ceramic pellets in the molten state of the carbonates for either carbon dioxide capture or sensor device evaluation.