

Electrochemical Oxygen Separation Using Solid Electrolyte Ion Transport Membranes

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A novel process employing solid electrolyte-based ion-transport membranes enables the production of high-purity oxygen at elevated pressure from a feed stream of ambient pressure air. This technology exploits the theoretically infinite selectivity of oxygen ion migration through a dense ceramic electrolyte membrane under the influence of an externally applied electrical potential. The solid electrolyte is derived from cerium oxide, with dopants added to enhance both ion transport and membrane processability. The oxidation and reduction reactions are promoted by the use of porous perovskite electrodes, which together with the electrolyte form an electrochemical cell. Stacks comprising multiple cells in a planar configuration have demonstrated excellent electrochemical performance and stability, mechanical integrity, and the capacity to produce high-purity oxygen over thousands of hours. An oxygen generator based on this technology must incorporate an integrated thermal management system, air mover, power supply, and control systems.