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Review

Solid oxide fuel cells for stationary, mobile, and military applications

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Abstract

Among all designs of solid oxide fuel cells (SOFCs), the most progress has been achieved with the tubular design. However, the electrical resistance of tubular SOFCs is high, and specific power output (W/cm^2) and volumetric power density are (W/cm^3) low. These low power densities make tubular SOFCs suitable only for stationary power generation and not very attractive for mobile applications. Planar SOFCs, in contrast, are capable of achieving very high power densities. Additionally, sizeable cost reductions are possible through a concept called â€œmass customizationâ€ that is being pursued in the US Department of Energy's Solid State Energy Conversion Alliance (SECA). This concept involves the development of a 3â€“10 kW size core planar SOFC module that can be mass produced and then combined for different size applications in stationary power generation, transportation, and military market sectors, thus eliminating the need to

produce custom-designed and inherently more expensive fuel cell stacks to meet a specific power rating. This paper discusses the recent work at the Pacific Northwest National Laboratory (PNNL) in support of the design and development of low-cost modular SOFC systems using lower temperature, anode-supported SOFCs.

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Keywords

Fuel cells; Oxide; Electricity (power) generation; Automotive; Military; Electrolyte; Electrodes; Cost

Keywords

Y_2O_3-stabilized ZrO_2 (YSZ); $LaGaO_3$; $LaMnO_3$; $LaFeO_3$; $LaCrO_3$; Ni

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