

Evaluation of Durable Glass-Magnesium Oxide Sealing Compositions for High Temperature Fuel Cells

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Materials & Systems Research, Inc. (MSRI) has formulated two glass-magnesium oxide sealing compositions for high temperature solid oxide fuel cells (SOFCs). The sealing compositions consist of base-glasses into which specific amounts of nano-size magnesium oxide were added. The compositions were tailored to yield specific phases on crystallization, resulting in significant reduction in the variability of their thermal expansion over time, at elevated temperatures. Thermal expansion and crystallization data over 2500 hours at 800°C indicate that Comp.-5 has the best stability over time while Comp.-3 though not as stable is better than BCAS glass. The compositions were fabricated into flexible gaskets by tape-casting and the gaskets were used for helium leak testing. The leak tests on glass / stainless steel seal interfaces suggest that compositions 3 and 5 display short term sealing characteristics that are at par with or better than that of BCAS glass at 800°C. Data obtained from a three cell stack (sealed with gaskets made from Comp.-5) tested at MSRI that uses Nd-doped LaCrO₃ coating on the sealing area of the stainless steel interconnects indicates satisfactory sealing performance. The glass-magnesium oxide sealing compositions when used in combination with the protective interconnect coatings provide sealing options that are likely to be chemically, thermally and mechanically stable over long durations of operation at the operating temperature of the SOFC stack.