

High-Temperature Viscous Sealing Glasses for Solid Oxide Fuel Cells

Cheol-Woon Kim^{*}, Cindy L. Schwartz, Joe Szabo, Kevin S. Barr, and Ted E. Day
MO-SCI Corporation, Rolla, MO 65401

^{*} ckim@mo-sci.com; (573) 364-2338

Richard K. Brow^{**} and Zhongzhi Tang
Department of Materials Science and Engineering and the Graduate Center for Materials
Research, Missouri University of Science and Technology, Rolla, MO 65409-1170

^{**} brow@mst.edu; (573) 341-6812

MO-SCI Corporation and the Missouri University of Science and Technology successfully identified and tested several glass compositions that could be used as viscous seals for Solid Oxide Fuel Cells (SOFCs) through a SBIR Phase I project (DE-SC0002491). The glasses possess desirable viscosity characteristics- that is, they have softening points in the temperature range expected for SOFC operations (650-850°C), and so cracks that might form in the glass on thermal cycling should be closed upon reheating through a 'viscous healing' mechanism. The new glasses have relatively low liquidus temperatures (< 800°C) and so do not exhibit significant crystallization when held at SOFC operational temperatures. Excessive crystallization will change the viscosity behavior and may jeopardize the viscous healing characteristics of the seal. In addition, the new glasses wet both aluminized SS441 and NiO/YSZ substrates, forming hermetic seals that have survived, in one case, dozens of thermal cycles between room temperature and 750°C. The glasses developed in Phase I exhibit no significant weight losses from the molten state when held in ambient air.