**Compliant Glass Seal Development at Pacific Northwest National Laboratory:**

**Effect of Fillers on Thermal Cycling, Isothermal ageing,**

**and Validation in a Stack Fixture Test**

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An alkali silicate glass (SCN-1) is currently being evaluated as a candidate sealing glass for solid oxide fuel (SOFC) applications. The glass containing ~17 mole% alkalis (K2O and Na2O) remains vitreous and compliant during SOFC operation. The non-crystallizing compliant sealing glass has lower glass transition and softening point, and hence can relieve or reduce residual stresses and has the potential for crack healing. Previous results of isothermal ageing of plain SCN-1 glass showed large pore formation that was considered detrimental to mechanical integrity. Approaches to minimize large pore formation were sought by adding inert fillers such as ZrO2 fibers and hollow balls. In this paper, SCN-1 glass with ZrO2 fibers and hollow balls was screened using deep thermal cycling tests. High temperature leak rates were measured and post-mortem analysis was conducted to assess the thermal cycle stability. A densification study with ZrO2 fibers was also conducted to establish optimum firing profiles. Sintered pellets were isothermally aged to study the microstructure evolution. In addition, plain SCN-1 glass, SCN-1 with 15% ZrO2 fibers, and SCN-1 with ZrO2 hollow balls (5:1 ratio) were tested in stack test fixtures with standard LSM-based cells in a combined ageing and thermal cycle test. The results shed new light on the topic of SOFC glass seal development.