Long-term thermal stability of glass sealing materials is an essential factor in providing hermetic seals for solid oxide fuel cell (SOFC) stacks. Many different glass compositions have been designed for the purpose of sealing at the SOFC operational temperature (generally 650 - 900°C). Crystallization of sealing glasses happens in many of the sealing glasses, which affects (beneficially or adversely) thermal expansion behavior of the sealing layer and interfacial bonding between the glass and other SOFC components. X-ray diffraction is (XRD) a critical tool in investigating the crystallization of sealing glasses.

In this work, a series of gallia- and strontia-containing glasses (GaBA series and GaSiB series) has been chosen for its promising sealing performance. After sealing tests with stainless steel interconnect and yttria stabilized zirconia (YSZ) electrolyte, the glasses show considerable amounts of Sr-containing crystals (40 – 50%) as determined using internal standard Rietveld analysis. It is also observed that crystallization is suppressed at the glass/YSZ interface. Combining XRD analysis and micrometer-scaled elemental analysis demonstrates that a minor dissolution of yttria into the glasses inhibits the devitrification. Based on the quantitative XRD and elemental results of the remnant glass after crystallization, the present glass compositions can be effectively refined to reduce crystallization during the sealing. Amorphous sealing with reduced crystallization will be further evaluated, and which is potentially more practical at lower temperature and better in self-healing.