Development of glass formulations for sealing applications in high-temperature steam electrolysis

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Abstract

Hydrogen production by high-temperature steam electrolysis is achieved using complex structures such as Solid Oxide Cells (SOC) stacks. Ensuring the sealing of this metallic/ceramic multilayer is technically very challenging. The sealing solution needs to meet several properties. Specific thermomechanical, chemical and electrical properties are mandatory for the sealing material in SOC stacks. Glasses and glass-ceramics have been identified as suitable candidates.

This study consists in the development of glass sealants for high-temperature electrolysis applications. Four glass systems have been identified as potential sealants for SOC currently developed at CEA. Based on literature review, glasses compositions were chosen due to their matching properties with the required ones. Figure 1 displays composition areas in CaO-Al2O3-B2O3 and BaO-Al2O3-B2O3 glass systems in which the Thermal Expansion Coefficient (TEC) corresponds to the required values.

Keywords: High, temperature electrolysis, Glass sealant, Thermomechanical properties

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