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Effects of brazing temperature on the joining properties of GDC-LSM/metal joint for oxygen transport membranes

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Reactive Air Brazing (RAB) is a relatively simple and inexpensive technique to hermetically seal the ceramic/ceramic and ceramic/metal joints. The joints formed by RAB generally reveal an excellent thermal cycling performance and long term stability in high temperature oxidation as well as reduced atmospheres, which can be used for the joining of oxygen transport membranes, solid oxide fuel cells and solid state sensors, etc. Here, we used RAB technique to produce sound joints between commercially available GDC-LSM ceramics to various metallic alloys, such as AISI 310S, FeCralloy and Crofer 22 APU. As a pre-requisite, utilization of RAB rests on developing a suitable filler material so as to have reasonable wetting for both ceramic and metallic substrates. A widely used filler system based on Ag-10 wt%, CuO was used by forming a green tape through tape casting. The effects of brazing temperatures on the interfacial microstructure and mechanical properties of the GDC-LSM/metal joints were examined. Brazing was performed at different temperatures of 1000, 1050 and 1100 °C for 30 minutes in air. The measurement of wetting angle was performed at each joining temperature to assess the degree of bonding. Interfacial microstructure and formation of various phases, cracks and voids were analyzed using SEM and EDS. Shear strength at room temperature was measured and correlated with the interfacial microstructure, mode of failure and joint thickness.

Biography

Myung-Dong Kim is currently pursuing graduation from the School of Materials Science and Engineering at Yeungnam University in Republic of Korea. His research topic is the joining of ceramic/metallic systems for oxygen transport membrane applications.

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