Development of Hermetic Sealant Material Based on the Temperature Distribution in IT-SOFC

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In this study, firstly, all heat source and amounts has been determined for electrolyte supported SOFC having 81 cm^2 active area and thus temperature distributions due to each heat source can computed and total temperature distribution clearly has been shown. For this, electrochemical, ohmic, activation and concentration polarization heat sources have been computed by using the boundary conditions taken from the experimental data such as current-voltage-power and mol fraction. Secondly, to provide hermetic seal SiO_2, CaO, Al_2O_3 and Na_2O based glass-ceramics has been produced and glass transition, softening temperatures and TEC have been tested by dilatometer and thus the most suitable sealant content has been selected.

There are some studies [1-9] on temperature distribution and heat sources, however, they has been investigate partial geometers such as one channel, one dimensions or some of the heat sources. There is no study about the effect of overall heat sources and temperature distributions on the sealant selection/production. The overall heat sources amount and distribution on the 9x9 cm^2 cell can be shown in Figure 1.

According temperature distribution, sealant material content was selected and molted at 1500 ^{O}C. Molten glass-ceramic and mold, produced from the furnace refractor material, can be shown in Figure 2.

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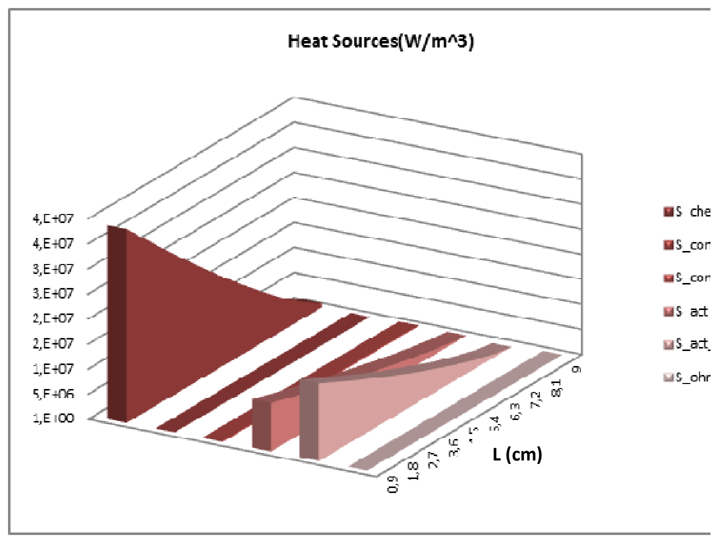

Figure 1. Different heat sources and distributions on the 81 cm^2 SOFC active area

Figure 2. Molten glass-ceramic (transparent appearance) in platinum crucible and mold for the sealant test samples