

Protocol for Densification of a Thin Ceria-doped Layer by Infiltration of Solutions at ICMCB

The densification by the infiltration route has the aim to fill the remaining pores of a screen-printed ceria layer infiltrating a nitrate solution containing both Ce and Gd in the right ratio. A GDC layer was first prepared by screen-printing, then pre-sintered at moderate temperature. The final density of the layer increases when decreasing the pre-sintering temperature, but the layer has to be mechanically strong enough to withstand subsequent infiltration steps, then a compromise has to be found. After optimization, the pre-sintering temperature was fixed to 1150 °C for 1 h. Secondly a solution of cerium and gadolinium was prepared by dissolving $\text{Ce}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ and $\text{Gd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ nitrates (Aldrich) with the proper stoichiometry (8:2) in water. The screen-printed layers were then infiltrated with the solution, and the nitrates were burnt at 450 °C during 20 min. The infiltration step can be repeated to increase the infiltration loading. After optimization, it was fixed to 4 steps, that gives a loading of infiltrated GDC of roughly 30 wt.% of the pre-sintered layer as determined by successive weight measurements. Considering the pre-sintered layers are around 50 % porous, with such loading the residual porosity was roughly 20 % before the final sintering step, which is easier to eliminate using the sole shrinkage provided by the sintering step.