Continuous Hydrothermal Flow Synthesis of Gd-doped CeO$_2$ (GDC) Nanoparticles for Inkjet Printing of SOFC Electrolytes

Gd$_x$Ce$_{1-x}$O$_{2-δ}$ (GDC) nanoparticles were synthesized using continuous hydrothermal flow synthesis. By varying the synthesis conditions, particle size and morphology could be tailored. Here, particle sizes between 6 to 40 nm with polyhedral or octahedral shape could be obtained. Gd$_{0.2}$Ce$_{0.8}$O$_{2-δ}$ nanoparticles were further processed into inks for inkjet printing. Despite the small particle size/large surface area, inks with excellent printing behavior were formulated. For proof-of-concept, thin GDC layers were printed on a) green NiO-GDC substrates, and on b) pre-sintered NiO-YSZ substrates. While no dense layers could be obtained on the green NiO-GDC substrates, GDC nanoparticles printed on NiO-YSZ substrates formed a dense continuous layer after firing at 1300 °C.