Enhanced mass diffusion phenomena in highly defective doped ceria

The densification and grain growth of the solid state ionic conductor material Ce0.9Gd0.1O1.95−δ (i.e. GDC10, gadolinium-doped ceria, with Gd 10mol.%) are analysed for nanometric and fine powders of various particle sizes, both in air and in a 9vol.% H2–N2 mixture. Due to a dominant solute drag effect in aliovalent highly doped ceria, the starting morphology of the powders controls the diffusion mechanisms of the material in air. Conversely, highly enhanced densification and grain growth are achieved by firing the materials at reduced temperatures (800