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Viscoelastic properties of doped-ceria under reduced oxygen partial pressure

Francesca Teocoli, De Wei Ni, Vincenzo Esposito

Abstract

The viscoelastic properties of $\text{Ce}_{0.9}\text{Gd}_{0.1}\text{O}_{1.95-\delta}$ (CGO) powder compacts are characterized during sintering and cooling under reduced oxygen partial pressure ($pO_2 < 10^{-12}$ atm) and compared with conventional sintering in air. Highly defective doped ceria in reducing conditions shows peculiar thermo-mechanical properties due to fast mass diffusion phenomena activated at low temperatures by Ce^{4+} to Ce^{3+} reduction. The combined effect of chemical reduction and temperature results in both (I) thermally activated enhanced mass diffusion mechanisms during the early stage of the sintering, and (II) consequent dramatic microstructural changes (fast grain growth and densification) which are rapidly completed during the final stage of the sintering.