

IN-SITU GENERATION AND GRAIN GROWTH OF CeO₂ NANOCRYSTALS IN AC/DC ELECTRICAL FIELDS

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We have performed a set of grain growth tests in AC, DC and no electrical field. We used crystalline cerium(III) oxalate, which gives upon heating (300 °C) nanocrystals of CeO₂. A pellet of cerium oxalate was decomposed in between two platinum electrodes (no current passing) with/without applied AC/DC electrical field. Therefore, the nanocrystals of CeO₂ were in situ generated under the electrical field and later grown by increasing temperature. The heating and field application was cut at desired temperature (400-1000 °C with 50 °C step). We have compared the grain growth and other characteristics (grain size, preferred orientation, strain, strain distribution etc.) for no field, AC field (50Hz), and DC. The electric fields applied were > 800V/cm. Figure 1 shows grain size and strain analysis for experiments done in AC field. We have found that the electric field has significant effect on the grain size, texture and strain, especially at low temperatures, when the thermally driven diffusion is plays minor role. In the case of CeO₂ the loss of electrical field effect is about 600 °C.

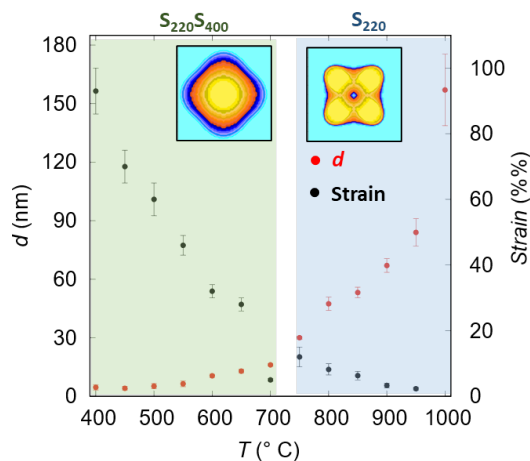


Figure 1 – Grain size and strain for CeO₂ treated at different temperature under AC electrical field. Strain distributions inside the crystallites is presented in the top part, strain texture is noted by color.