# Synthesis and characterization of mesoporous CeO2 and SDC powders obtained via direct condensation method

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## Abstract

A novel synthesis for the preparation of mesoporous ceria and samaria-doped ceria (SDC) has been developed. This direct condensation route combines the low cost of nitrate-based conventional co-precipitation method with the morphological characteristics of mesoporous materials obtained by self-assembling sol-gel chemical routes. Both ionic and non-ionic surfactants were used to obtain mesostructured materials at room temperature. The resulting CeOx·nH2O and (Ce,Sm)Ox·nH2O powders require low calcination temperatures for the complete oxidation to CeO2 and to the stoichiometric (SmO1.5)0.2·(CeO2)0.8. High specific surface area and ordered mesoporosity are preserved after such low temperature thermal treatments. The steps of the reaction were investigated via FT-IR and NMR analysis. The appropriate thermal treatments were selected on the basis of TG-DTA: complete calcination and surfactant out-gassing occurred at around 450°C. EDAX and XRD analysis were performed to characterize the calcined powders in terms of phase purity and structure, while FE-SEM, HR-TEM, XRD at low angles and BET were performed to evaluate meso-ranged order, pore size and specific surface area. Very small crystallite size was determined for the calcined powder by XRD and pore size varied in the mesoporosity range depending on the different templating agents used.