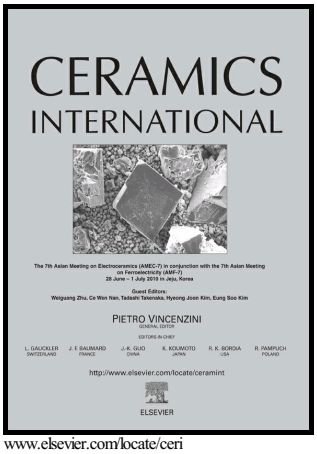

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Thermal stability of transition alumina nanocrystals with different microstructures

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Abstract

The preparation of well-crystallized boehmite nanoparticles with different morphologies, encompassing from aciculae or rods of 320, 150 and 70 nm of length to platelets of 50 nm in diameter, allowed a comparative study of their respective thermal evolutions as alumina precursors. Static thermal treatments of boehmite nanocrystals at 600, 1000 and 1200 °C and a dynamic, in situ synchrotron study between 100 and 1000 °C revealed that original boehmite microstructures, i.e. size and shape of the nanoparticles, were kept not only in γ-Al_2O_3 but also in transitional aluminas up to 1000 °C. Specifically, at that temperature, acicular samples presented θ-Al_2O_3 structure, while in platelet-like nanoparticles δ-Al_2O_3 was identified. Each precursor morphology favored the respective transition phase, extending the thermal stability range over the limits previously reported in the literature.

The described methodology was successfully applied to tailor-make transitional Al_2O_3 nanocrystals with microstructures ranging from fibers and rods to platelets, enhancing their thermal stability and thus their potential applications. Different transition sequences were also reported for the different shapes of nano-boehmite precursors.