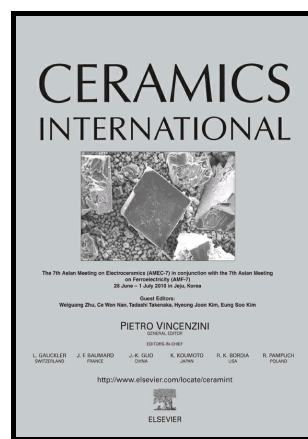


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Nanoscale synthesis of single-phase forsterite by reverse strike co-precipitation and its high optical and mechanical properties

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Abstract

Forsterite is a magnesium silicon oxide mineral with an olivine structure and a diverse spectrum of applications, ranging from biomedical to optical devices. Controlled purity and crystalline phases are key requirements for such applications, but the literature shows a limited understanding of the synthetic routes that would enable such control, in particular at the nanoscale. In this work, single-phase forsterite nanopowder with a crystallite size of 15.3 nm was synthesized by reverse strike co-precipitation. A reaction mechanism for the synthesis was proposed based on DSC/TGA analysis and intermediate products. Forsterite pellets using the nanopowder were produced by low-cost cold-pressing and showed high transparency and densities above 93%. The nanosized crystals allowed for lower sintering temperatures and enhanced hardness.

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