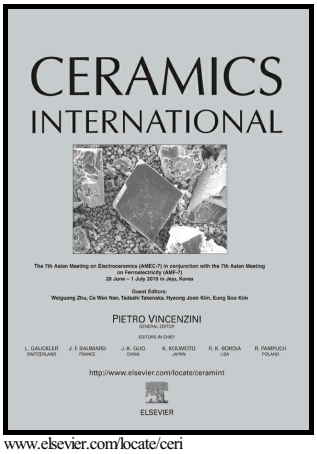

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Preparation and characterization of novel nonstoichiometric magnesium aluminate spinels

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Abstract

Magnesium aluminate spinel is of great importance for nuclear industry, and its structure, showing a great impact on properties, is sensitive to the composition. In order to explore the stoichiometric effect on structure and properties of spinels, several different spinel compositions with $MgO \cdot nAl_2O_3$ (n = 0.5-2.4) were synthesized via solid state reaction. Synthetic samples were characterized by X-ray diffraction, scanning electron microscope and nanoindentation tests. The results of XRD and SEM indicate that the single-phase magnesia alumina spinels have been prepared successfully for the first time ranging from n = 0.667 to n = 1.5, which is beyond the previous reported ranges of $n \geq 0.91$. The hardness and modulus decrease with increasing n, implying further that the nonstoichiometric spinel crystal structures are likely to exhibit superior mechanical properties.