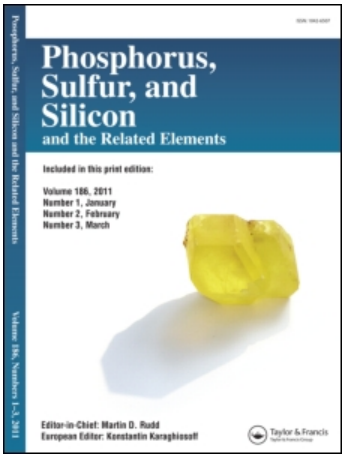

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Effect of Spark Plasma Sintering on Densification and Mechanical Properties of LaPO 4 -ZrO 2 Composites

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EFFECT OF SPARK PLASMA SINTERING ON DENSIFICATION AND MECHANICAL PROPERTIES OF $LaPO_4$-ZrO_2 COMPOSITES

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It recently has been found that when $LaPO_4$ with a high melting point of 2072 ± 20°C[1] was added to other refractory oxides, such as Al_2O_3 (melting point, 2050°C) or ZrO_2 (melting point, 2700°C), the machinable composites with high strength and high melting temperature could be obtained. In this work the spark plasma sintering (SPS) technique was used to manufacture $xLaPO_4$-(1-x)ZrO_2 (x = 0 to 1) composites. The mixture of $LaPO_4$ and ZrO_2 powder was sintered in a graphite die at 1300°C, 40 MPa for 2 to 3 min in a vacuum. Usual pressureless-sintering technique was also used to compare the properties. The sintered composites were found to be machinable. The SPS method gives dense sintered bodies with the relative densities above 96% whereas the relative densities of composites sintered by pressureless sintering method is above 90%. The mechanical properties obtained by SPS had higher strength (387 MPa, x = 0.3) and fracture toughness (4.3 MPa·$m^{1/2}$, x = 0.3) than those obtained by pressureless-sintering (148.6 MPa, 3.1 MPa·$m^{1/2}$). The results show that the SPS method increases density and bending strength of the composites; it, however, weakens the machinability.

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[1] Y. Hikichi and T. Nomura, *J. Am. Ceram. Soc.*, **7**[10], C-252 (1987).

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