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# Synthesis and Microwave Dielectric Properties of 2ZnO·3B<sub>2</sub>O<sub>3</sub>-doped ZnAl<sub>2</sub>O<sub>4</sub> Low-Permittivity Ceramics

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**ABSTRACT:** 2ZnO·3B<sub>2</sub>O<sub>3</sub>-doped ZnAl<sub>2</sub>O<sub>4</sub> ceramics were synthesized via solid-state method. Influence of different 2ZnO·3B<sub>2</sub>O<sub>3</sub> additions on the microstructure, sintering behavior and microwave dielectric properties has been investigated. The results showed that zinc borate could effectively improve the densification and expand the sintering temperature range. Microwave dielectric properties of 2ZnO·3B<sub>2</sub>O<sub>3</sub>-doped ZnAl<sub>2</sub>O<sub>4</sub> ceramics were exhibited as follow:  $\epsilon_r = 8.32$ ,  $Q \times f = 93,600$  GHz (at 14.0 GHz) and  $\tau_f = -68.5$  ppm/°C. Spinel-structured zinc borate-doped ZnAl<sub>2</sub>O<sub>4</sub> ceramics possessed comparatively low sintering temperatures, wide temperature regions (about 100°C), simultaneously, high  $Q \times f$  and stable  $\tau_f$  values. These outstanding performance make them promising candidate materials for millimeter-wave devices at high frequency.

**Keywords:** Dielectric properties; ZnAl<sub>2</sub>O<sub>4</sub> ceramics; Zinc borate; Sintering aid.

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