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Synthesis and Microwave Dielectric Properties of $2ZnO \cdot 3B_2O_3$-doped $ZnAl_2O_4$ Low-Permittivity Ceramics

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ABSTRACT: $2ZnO \cdot 3B_2O_3$-doped $ZnAl_2O_4$ ceramics were synthesized via solid-state method. Influence of different $2ZnO \cdot 3B_2O_3$ 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 $2ZnO \cdot 3B_2O_3$-doped $ZnAl_2O_4$ ceramics were exhibited as follow: ε_r = 8.32, Q×f = 93, 600 GHz (at 14.0 GHz) and τ_f = -68.5 ppm/℃. Spinel-structured zinc borate-doped $ZnAl_2O_4$ ceramics possessed comparatively low sintering temperatures, wide temperature regions (about 100℃), simultaneously, high Q×f and stable τ_f values. These outstanding performance make them promising candidate materials for millimeter-wave devices at high frequency.

Keywords: Dielectric properties; $ZnAl_2O_4$ ceramics; Zinc borate; Sintering aid.