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# Study on microstructure and dielectric properties of aluminum nitride ceramics

Xiulan He<sup>a,\*</sup>, Lei Shi<sup>a</sup>, Yingkui Guo<sup>a</sup>, Junwang Liu<sup>a</sup>, Feng Ye<sup>b</sup>

<sup>a</sup>*Department of Materials Science and Engineering, Harbin University of Science and Technology, Harbin 150040, P R China*

<sup>b</sup>*Department of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, P R China*

## Abstract

Aluminum nitride (AlN) ceramics were sintered with spark plasma sintering (SPS) technique using  $Y_2O_3$  ( $Sm_2O_3$ )- $CaF_2$  as the sintering additives. The purification effect of sintering additives, dielectric properties, microstructure and polarization mechanism of AlN ceramics were investigated. The densification process curves indicate that both sintering additive and special SPS sintering mechanism are conducive to reducing the sintering beginning temperature. The results of lattice parameters of AlN ceramics suggest that suitable sintering additives have prominent purification effect on the crystal lattice of AlN ceramics. Dielectric constant increases with  $Y_2O_3$  ( $Sm_2O_3$ ) content increasing, and the AlN ceramic containing 2 wt.%  $Sm_2O_3$ -1 wt.%  $CaF_2$  exhibits the lowest dielectric loss. Oxygen impurities, dislocation and amorphous layer in the crystal structure of AlN ceramics increase dielectric loss of AlN ceramics. The space charge polarization caused by secondary phases and other defects might be main polarization mechanism of AlN ceramics.

**Keywords:** AlN ceramics; Sintering; Microstructure; Dielectric property

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Corresponding author at: Tel.: +86-451-86392563 Fax: +86-451-86392500

E-mail address: hexiulan1973@126.com

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