Preparation and Characteristics of a Magnetic-Dielectric (F_3O_4/ $BaTiO_3$) Composite by Ferrite Plating with Ultrasound Irradiation

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There has been a great of interest on magnetic composites. Recently, magnetic composites have been reported in the ferrite-forsterite and ferrite-cordierite systems, which exhibit considerable changes in properties [1, 2]. However, such composites require usually high temperature for crystallization of ferrite. Ferrite plating with ultrasound irradiation enables formation of ferrite films directly on substrates of various shapes at low temperatures (60~100℃).

Fe_3O_4-encapsulation was performed on $BaTiO_3$ powder with grain size of 500 ㎚ using ultrasound enhanced ferrite plating to prepare a magnetic-dielectric composite powder. The effect of the plating conditions on the formation of Fe_3O_4 was investigated and the optimum plating conditions were determined [3]. The Fe_3O_4/$BaTiO_3$ composite powder exhibited Fe_3O_4 grains deposited densely on the surface of the $BaTiO_3$ powder.

In this study, comparative microwave absorbing measurements was performed on Fe_3O_4, Fe_3O_4/$BaTiO_3$ mixed, synthesized Fe_3O_4/$BaTiO_3$ composite and $BaTiO_3$ specimens, The results showed that the matching frequency of those specimens of the same thickness shifted to higher frequency in sequence, compared to that of the $BaTiO_3$ one. In sintered Fe_3O_4/$BaTiO_3$ composite powder, the nanosized coated Fe_3O_4 grains helped a low temperature sintering of Fe_3O_4/$BaTiO_3$ composite at a much lower temperature, compared to the sintering temperature of the pure $BaTiO_3$, The sintered Fe_3O_4/$BaTiO_3$ composite revealed a large magneto-electric properties, simultaneously.

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References

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