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Clausius–Mossotti relation fractal modification

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Abstract

The microstructure characteristic and dielectric properties of doped $BaTiO_3$-ceramics were investigated in the light of the Clausius–Mossotti relation (CMR) which incorporates both the Curie and Curie–Weiss Laws. The samples of

compositional studies were performed by SEM equipped with EDS system. The Clausius–Mossotti relation is used to clarify the influence of dopant on the dielectric properties and $BaTiO_3$ phase transformation. Curie parameters (*C*, *Tc*) were calculated by using a Curie–Weiss law. Also, a new approach on correlation between microstructure and dielectric properties of doped $BaTiO_3$ based on fractal nature analysis (grains shapes, pores and intergranular contacts) have been developed, by using fractals in microstructure configurations reconstruction. This includes reconstruction of grain surface i.e. pore surface as tensor product of appropriate fractal curves. Particles chaotic motion trajectories is considered as Brownian motion which is then linearized in fractal manner. Fractality of grain surface, pore surface and particle motion introduce three fractal factors. Our hypothesis is that working temperature of $BaTiO_3$-ceramics must be influenced by ceramics material fractality; these three fractality factors, appear as a correction of theoretic temperature appearing in Clausius–Mossotti relation i.e. Curie–Weiss law.

KEYWORDS: Clausius–Mossotti relation, $BaTiO_3$-ceramics, fractals, tensors product

Additional information

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