Dielektriniai $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ keramikos tyrimai

Investigation of dielectric relaxation processes in $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ ceramics

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$Ba_4Nd_2Fe_2Nb_8O_{30}$ ceramics belong to the tetragonal tungsten bronze (TTB) structural family, which attracted much attention in recent years [1]. $Ba_4Nd_2Fe_2Nb_8O_{30}$ (Ln = La, Pr, Nd, Sm, Eu, Gd) family of ceramics is known to have a wide variety of interesting properties. Compounds with neodymium, samarium and europium are ferroelectrics, while ceramics with praseodymium and gadolinium exhibit relaxor properties [2, 3]. Moreover, Pr, Nd, Sm, Eu, Gd samples exhibit at room temperature magnetic hysteresis loops, due the presence of the very small amount of barium ferrite secondary phase [2].

In this work dielectric properties and the phase diagram of $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ (x = 0.6, 0.8, 1) are presented. The broad dielectric anomaly in $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ is the sum of different relaxation processes. The relaxation process at higher temperatures (above 1 MHz) is the soft relaxation mode and the ferroelectric phase transition in $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ is of "order-disorder" type. The dielectric spectra of $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ (x = 0.6 and 0.8) ceramics is typical for ferroelectric relaxor's. The relaxor nature of these ceramics also confirms the broad and asymmetric distributions of relaxation times at lower temperatures. The mean and most probable relaxation times of these ceramics follow the Vogel-Fulcher law.

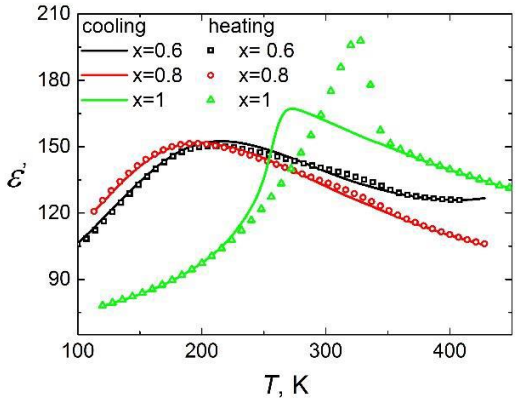

Fig.1 Temperature dependence of the dielectric permittivity for $Ba_{6-2x}Nd_{2x}Fe_{1+x}Nb_{9-x}O_{30}$ ceramics with different x on heating (symbols) and cooling (lines) at 1 MHz frequency.

Keywords: dielectric, ceramic, relaxation.

References

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