$Ag_{1-x}Li_xNbO_3$ ($x \leq 0{,}08$) keramikos dielektrinė spektroskopija

Dielectric Spectroscopy of $Ag_{1-x}Li_xNbO_3$ ($x \leq 0.08$) Ceramics

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The search for new materials with optimal piezoelectric properties is an important goal of materials science. It is believed that piezoelectric lead-free niobate materials can be an alternative to already known and used piezoelectric materials [1]. One such material is from the perovskite structure - silver niobate ($AgNbO_3$, AN). The substitution of Ag by Li ions in mixed $Ag_{1-x}Li_xNbO_3$ (ALN) is commonly accepted method to improve ferroelectric and piezoelectric properties of materials. The dielectric properties of ALN were investigated mainly at low frequencies.

The aim of the work is to study ferroelectric and electrical properties of $Ag_{1-x}Li_xNbO_3$ ceramics via broadband (20 Hz – 750 THz) spectroscopy, piezoelectric and ferroelectric polarization measurements.

Temperature dependences of the complex dielectric permittivity for ALN5 ceramics at different frequencies are presented in Fig. 1. The dielectric permittivity maximum related with ferroelectric phase transition is observed close to 400 K. Close to the ferroelectric phase transition temperature no dielectric dispersion is observed up to 9 MHz. Onset of dielectric dispersion is observed close to 10 GHz. At lower temperatures two additional frequency dependent dielectric anomalies are clearly expressed in temperature dependence of dielectric losses. These anomalies are related with different ferroelectric domains dynamics.

The ferroelectric phase transition temperatures strongly decreases with lithium concentration for ALNx when $x \leq 0.4$, thus indicating importance of Ag ions coupling for ferroelectric phase transition. In contrast close to and above the morphotropic phase boundary the ferroelectric phase transition temperatures strongly increase with lithium concentration, which is typical for diluted $LiNbO_3$ behaviour.

Keywords: silver niobate, ferroelectrics, ferrielectrics, dielectric permittivity.

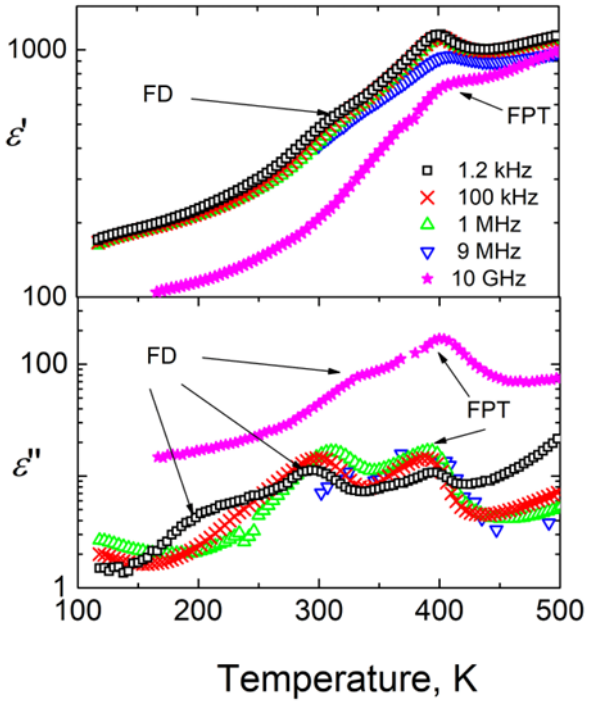

Fig. 1. Temperature dependence of complex dielectric permittivity for ALN5 ceramics at different frequencies (FD – ferroelectric domains related dielectric anomaly, FPT – ferroelectric phase transition related dielectric anomaly).

References

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