DIELECTRIC AND ACOUSTIC PROPERTIES OF SOME BETAINE AND GLYCINE COMPOUNDS
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Acoustic and dielectric properties of some compounds of the amino acid betaine (CH₃)₃N⁺CH₂COO⁻ and glycine (N⁺H₃CH₂COO⁻) with inorganic H₃AsO₄, H₃PO₄ and H₃PO₃ acids have been studied in the vicinity of phase transitions. The crystals have a similar structure, characterized by the linking of hydrogen bonds of the inorganic AsO₄⁻, PO₄⁻ or HPO₃⁻ tetrahedra to zig-zag chains, each betaine or glycine attached via O-H…O bond to these inorganic units. Betaine arsenate (BA), betaine phosphite (BPI) and glycine phosphite (GPI) show ferroelectric behavior, while betaine phosphate (BP), as well as deuterated betaine phosphate (DBP) and arsenate (DBA) exhibit antiferroelectric transitions. Moreover these compounds have also a high-temperature proper (BA, DBA) or improper (BP, DBP, BPI) ferroelastic phase transition.

Small- and strong-signal dielectric response, including the electric field effect on dielectric constant and the dielectric hysteresis phenomena, the temperature dependences of the velocity and attenuation of acoustic waves have been studied. The influence of the bias electric field on the sequence of phase transitions and the partial temperature hysteresis loops of elastic constant has been investigated also.

It is shown that the dielectric and acoustic properties of the crystals can be described in the framework of the Landau phenomenological theory with account of bilinear or biquadratic coupling between polar (polarization) and nonpolar (centrosymmetrical or non-centrosymmetrical structural) order parameters. We have determined coupling coefficients between the order parameters and have described the basic dielectric and acoustic properties of the crystals in the region of the phase transition sequence.

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