Etude de la transition ferroelectrique-ferroelastique du KD2PO4 forme du front de phase en fonction du gradient thermique

The thesis explores complex process of first order transition of KD2PO4 crystal from tetragonal phase to ferroelectric – ferroelastic orthorhombic phase and back at temperature 209 K. The experimental set up of nitrogeneous cryostat allowes temperature and temperature gradient variations during simultaneous three axes optical sample observations, dielectric measurements.
The discontinous change of order parameters especially strain uzz along tetragonal-feroelectric axis is important for form of phase front, which tents to be perpendicular to tetragonal axis z. To the contrary, if external electric field along tetragonal ferrolectric axis is applied, phase front tents to be parallel to applied electric field. Coupled strain shear and electric polarisition of orthorhombic low symetry phase are compensated by domain structure.
The observed flat and zigzag shapes of phase front under different experimental conditions are explained. It is shown that the resulting shape which is often of a zigzag form for temperature gradient perpendicular to ferroelectric axis follows from the competition between the free energy induced by the gradient, the elastic-strain energy caused by lattice misfits along the interface and the interface surface energy.
The experimental results could be in particular interesting for researchers who are not able to observe crystal during phase transitions.