

MS16-P02 | PURE GYROTROPIC FERROELASTIC PHASE TRANSITIONS IN THE MATERIALS PbMXO₄ (M = BA, SR; X=SI,GE): A NEW PIEZOELECTRIC FAMILY

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Gyrotropic phase transitions are characterized by the appearance of a spontaneous optical activity [1]. The appearance of such activity is very common in ferroelectric materials. In such materials, the optical activity is a secondary order parameter and is coupled to the primary order parameter which is the electrical polarization. However, only very rare examples are known of a pure gyrotropic phase transition.

In this contribution, we have investigated materials belonging to the BaNdGaO₄ structural type (space group P2₁2₁2₁), of general formula PbMXO₄ (M= Sr, Ba; X = Si, Ge) using powder X-ray diffraction as function of temperature, second harmonic generation and piezoelectric properties. We present extensive studies on PbMGeO₄ and preliminary results on the Si doped systems. PbSrGeO₄ shows a 2nd order type phase transition towards a Pnma structure with metrically hexagonal phase. On the contrary, PbBaGeO₄ exhibits a first order phase transition, similarly to (C₅H₁₁NH₃)₂ZnCl₄, however with a phase competition between the high and low temperature phases over almost 200°C.

Second harmonic generation and investigation of the piezoelectric properties demonstrated that this family is a new playground for new non-linear optical materials and identify the BaNdGaO₄ structural type as a new source for pure gyrotropic materials.

[1] C. Konak, V. Kopsky, F. Smutny; J. Phys. C: Solid State Physics 11, 2493 (1978)

[2] S. Prosandeev, I. A. Kornev, L. Bellaiche; Phys. Rev. Lett. 107, 117602 (2011)