PHASE TRANSITION FROM A PARAMAGNETIC TO A MAGNETICALLY ORDERED CRYSTAL.

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On the basis of Landau's theory we have calculated the continuous phase transition of a paramagnetic crystal of symmetry P6/mmm to magnetically ordered phases. The symmetry changes are induced by active representations connected with the wave vector k = k0/2, \(-0.5 < \alpha < 0.5\). These representations fulfill the reality condition, the Kovalev condition and the weak Lifshitz condition. We have considered two active representations which correspond to spins perpendicular to the C6 axis. It has been proved that there can appear two types of spin structures: (i) with constant spin length, i.e. helical structures, and (ii) with varying spin length, i.e. sinusoidal structures. For the first case, formulae for the spiral structures which are valid for any value of Nelsontemperature become sinusoidal structures. For the corresponding phase transition can be continuous. In Landau's theory, the magnetic group to be assigned to a particular chacteristic for neodymium crystal. The type of the polar three-fold axis is lost and one pseudo two-fold axis becomes a real one. Two Hg-atoms become symmetrically independent with helical spin structures. With an appropriate parameter value of \(\alpha\) we can obtain the helical structure of dysprosium crystal. In Landau's theory, the corresponding phase transition can be continuous. For the second case we give an example of a sinusoidal spin structure which is characteristic for neodymium crystal. The type of the structure group to be assigned to a particular spin structure depends on the value of \(\alpha\).

Ferroelectric Phases and Order Parameter Treatment in Pb5(Po.2As.0.5)2

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Lead phosphate and the isostructural mixed crystals of lead phosphate-arsenate exhibit ferroelectric transitions between the phases R3 m, C2/c and P21/c. Precision measurements of optical birefringence and dielectric measurements revealed at temperatures below 100K in all compounds a further transition. In lead arsenate this probably corresponds to the transformation of Pb5(VO3)2 to the acentric phase F2c.

05.1-46 FERROELASTIC PHASES AND ORDER PARAMETER TREATMENT IN Pb5(Po.2As.0.5)2 By U. Bismayer, E. Salje*, A. M. Blazer and J. Cosier, Clarendon Laboratory, Parks Rd., Oxford OX1 3PU, UK.

Lead phosphate and the isostructural mixed crystals of lead phosphate-arsenate exhibit ferroelectric transitions between the phases R3 m, C2/c and P21/c. Precision measurements of optical birefringence and dielectric measurements revealed at temperatures below 100K in all compounds a further transition. In lead arsenate this probably corresponds to the transformation of Pb5(VO3)2 to the acentric phase F2c.

In Pb5(PO4)3 the critical order parameter exponent \(B\) fits in with a multiparameter order parameter model with \(q = 3, d = 2\) (Salje and Devarajan, J. Phys. C (1981) 14, L1029). Along with the results of infrared reflection spectroscopy, diffuse X-ray, neutron and Raman scattering, the precise ordering behaviour indicates dynamical fluctuations in Pb5(PO4)3 and a static intermediate phase in the mixed crystals.

The transition C2/c - P21/c is interpreted in terms of a two-order-parameter theory, which clearly demonstrates how the first-order transition in pure Pb5(ASO4)2 becomes smoother in Pb5(PO4)2.089,089.

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05.1-47 STRUCTURES OF THE FERROELECTRIC AND PARAELECTRIC PHASES OF METHYLMONONITRDE

TRICHLOROINERCURATE. By M. Horer, P. Pratschke and J.W. Bas, Institut für Kristallographie der Universität, Frankfurt am Main, Federal Republic of Germany.

A first order ferro/paraelectric phase transition in CH3NH3HgCl3 at 61°C was observed by differential scanning calorimetry, by birefringence and DAX-measurements. The DSC-peak exhibits considerable structure and extends over about 1°C. The ferroelectric room temperature structure has space group P21 but shows three pseudo two-fold axes (Ben Salah et al., J. anorg. allg. Chem. (1982) 493, 178). Further refinement was achieved by the introduction of two domains linked by a pseudo two-fold axis (R(2) decreased from 0.056 to 0.046). In the paraelectric phase, the structure is described in the monoclinic space group C2 (a = 3.018(2), b = 3.858(1), c = 9.73(4), \(B = 90.49(2)\)). The polar three-fold axis is lost and one pseudo two-fold axis becomes a real one. Two Hg-atoms become symmetrically independent with drastically changed Hg-Cl distances as compared with the ferroelectric phase. Spectroscopic studies of the dynamics of the phase transition are in progress. The structures of the chemically related compounds CH3NH3HgBr3(space group P21/c; a = 4.908(4), b = 7.056(4), c = 14.817(11), \(B = 91.70(4)\)) were also determined, but these compounds are not ferroelectric at room temperature.


Quartz and its isotype ALP04 (Berlinite) have many physical properties in common, especially the symmetry change at the \(\alpha\)-\(\beta\) transition and the microdomain structure near the transition temperature. We report on our elastic neutron scattering results of the intermediate incommensurate phase of ALP04 existing in a temperature range of about 1.5 K between the \(\alpha\) and the \(\beta\) phase. The experiments were performed on the triple axis spectrometer UNIQRAS at the FRJ-2 reactor in Jülich using 0.25° collimation.

Crystals with typical dimensions of 2.5 x 2.5 x 20 mm³ were grown under hydrothermal conditions. After having passed the \(\omega\)-\(\alpha\) transition several times, satellite reflections were observed in the directions parallel to the reciprocal lattice vector Q exhibit large structure factors. After having passed the \(\omega\)-\(\alpha\) transition several times, satellite reflections were observed in the directions parallel to the reciprocal lattice vector Q exhibit large structure factors. After having passed the \(\omega\)-\(\alpha\) transition several times, satellite reflections were observed in the directions parallel to the reciprocal lattice vector Q exhibit large structure factors. After having passed the \(\omega\)-\(\alpha\) transition several times, satellite reflections were observed in the directions parallel to the reciprocal lattice vector Q exhibit large structure factors. After having passed the \(\omega\)-\(\alpha\) transition several times, satellite reflections were observed in the directions parallel to the reciprocal lattice vector Q exhibit large structure factors.