05.1–45 PHASE TRANSITION FROM A PARAMAGNETIC TO A MAGNETICALLY ORDERED CRYSTAL.
By T. Maczyński and J. Kociński, Institute of Physics, Warsaw Technical University, 00-662 Warszawa, Koszykowa 75, Poland.

On the basis of Landau's theory we have calculated changes of symmetry at a continuous phase transition of a paramagnetic crystal of symmetry $P6_3/mmc1'$ to magnetically ordered phases. The symmetry changes are induced by active representations connected with the wave vector $\vec{k} = \gamma\vec{b}_3$, $/-0.5 < \gamma < 0.5/$. These representations fulfil the reality condition, the Kovalev condition and the weak Lifshitz condition. We have considered two active representations which correspond to spins perpendicular to the C_6 axis. It has been proved that there can appear two types of spin structures: /1/ with constant spin length, i.e. helical structures, and /2/ with varying spin length, i.e. sinusoidal structures. For the first case, formulae for the spiral structures which are valid for any value of γ from the interval $/-0.5,0.5/$ have been given. We can thus obtain commensurate or incommensurate helical spin structures. With an appropriate value of γ 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 magnetic group to be assigned to a particular spin structure depends on the value of γ.

05.1–46 FERROELASTIC PHASES AND ORDER PARAMETER TREATMENT IN $Pb_3(P_{1-x}As_xO_4)_2$.
By U.Bismayer, E.Salje+, A.M.Glazer and J.Cosier, Clarendon Laboratory, Parks Rd.,Oxford OX1 3PU, UK.
+Institut für Kristallographie und Petrographie, Universität Hannover, Welfengarten 1, 3000 Hannover 1, Fed. Rep. Germany.

Lead phosphate and the isostructural mixed crystals of lead phosphate-arsenate exhibit ferroelastic transitions between the phases $R\bar{3}m$, $C2/c$ and $P2_1/c$. High 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 $Pb_3(VO_4)_2$ to the acentric phase $P2_1$.
In $Pb_3(PO_4)_2$ the critical order parameter exponent β fits in with a multicomponent 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 precursor ordering behaviour indicates dynamical fluctuations in $Pb_3(PO_4)_2$ and a static intermediate phase in the mixed crystals.
The transition $C2/c - P2_1/c$ is interpreted in terms of a two-order-parameter theory, which clearly demonstrates how the first-order transition in pure $Pb_3(AsO_4)_2$ becomes smoother in $Pb_3(P_{0.2}As_{0.8}O_4)_2$.

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05.1–47 STRUCTURES OF THE FERROELECTRIC AND PARAELECTRIC PHASES OF METHYLAMMONIUM TRICHLOROMERCURATE.
By M.Körfer, H. Fuess and J.W.Bats,Institut für Kristallographie der Universität,Frankfurt am Main,Federal Republic of Germany

A first order ferro/paraelectric phase transition in $CH_3NH_3HgCl_3$ at 61°C was observed by dif ferential scanning calorimetry,by birefringence and DK-measurements. The DSC-peak exhibits considerable structure and extends over about 1°C. The ferroelectric room temperature structure has space group $P3_2$,but shows three pseudo two-fold axes(Ben Salah et al.,Z.anorg.allg. Chem. (1982) 493,178).Further refinement was achieved by the introduction of two domains linked by a two-fold axis (R(F) decreased from 0.056 to 0.046). In the paraelectric phase,the structure is described in the monoclinic space group C2 (a=13.818(2),b=7.884(1),c=9.734(3),ß=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 $CH_3NH_3HgBr_3$(space group $P2_1/m$;a=7.985(2);b=6.387(8),c=8.728(3), ß = 117.17(3)) and $CH_3NH_3HgJ_3$ (space group $P2_1/n$; a=9.089(4),b=7.006(4),c=14.817(11),ß=91.70(4)) were also determined, but these compounds are not ferroelectric at room temperature.

05.1–48 A NEUTRON SCATTERING STUDY OF THE INCOMMENSURATE PHASE IN ALPO4 (BERLINITE) NEAR THE α-β TRANSITION.
By H. Arnold+, J. Bethke+, G. Eckold+ ++, Th. Hahn+, J. Min-Hua+++; + Inst. für Kristallographie, RWTH Aachen, 51 Aachen, ++ Inst. für Festkörperforschung, Kernforschungsanlage Jülich, 5170 Jülich, FRG; +++ Crystal Material Institut,Shandong University,Jinan Shandong, The Peoples Rep. of China.

Quartz and its isotype ALPO4 (Berlinite) have many physical properties in common, especially the symmetry change at the α-β transition and the microdomain structure near the transition temperature. We report on our elastic neutron scattering results of the intermediate incommensurate phase of ALPO4 existing in a temperature range of about 1.5 K between the α and the β phase. The experiments were performed on the triple axis spectrometer UNIDAS 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 α-β transition several times, satellite reflections were observed in the directions a*, b* and a* - b* in various Brillouin zones. In particular,satellites corresponding to directions of the modulation vector $\underline{q}$ perpendicular to the reciprocal lattice vector $\underline{Q}$ exhibit large structure factors. The temperature dependence of $\underline{q}$, which indicates the incommensurate character of this intermediate phase has been determined unambigously. Within the temperature interval of 1.5 K the satellites display a linear shift from q = 0.02 up to q = 0.038 reciprocal units with increasing temperature.