Phenomenological analysis of the phase transitions sequence in the ferroelectric crystal $(CH_3NH_3)_5Bi_2Cl_{11}$ (PMACB).

Autorzy

P. Carpentier

Piotr Zieliński

J. Lefebvre

Ryszard Jakubas

Rok wydania

1997

Czasopismo

Zeitschrift für Physik B: Condensed Matter

Numer woluminu

102

Strony

403-414

DOI

10.1007/s002570050305

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

A phenomenological model is proposed to describe the sequence of phase transitions in Pentakis (methylammonium) Undecachlorodibismuthate (111), $(CH_3NH_3)_5Bi_2Cl_{11}$ (PMACB) crystal on the basis of the recent structural data. The ferroelectric phase transition at 307 K is attributed to the ordering in a sublattice of the methylammonium cations $CH_3NH^+_3$ } placed in centrosymmetric sites in the paraelectric phase, whereas the isomorphous anomaly at about 180 K is related to a variation of the order in the sublattice of the remaining $CH_3N\,H^+_3$ } cations. The phenomenological thermodynamic potential is constructed for this system of two nonequivalent sublattices and the numerical values of its coefficients are then estimated from the dielectric, pyroelectric and calorimetric data. The sublattices are found to be weakly coupled near the ferroelectric phase transition. The anomaly at 180 K is interpreted as a continuous trace of a first order phase transition in a field created by the cations already ordered in the ferroelectric phase transition. This is analogous to a cusp A_{+3} in the catastrophes theory. The comparison of the Curie constants with the saturation values of the spontaneous polarization suggests that the sublattices cannot be treated as consisting of simple two-states pseudospins.

Adres publiczny

https://doi.org/10.1007/s002570050305

Strona internetowa wydawcy

http://link.springer.com