

Successive phase transitions and ferroelasticity of $[(\text{CH}_3)_2\text{NH}_2]_3\text{Bi}_2\text{I}_9$.

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Rok wydania

1990

Czasopismo

Phase Transitions

Numer woluminu

27

Strony

25-36

DOI

10.1080/01411599008206897

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Preliminary X-ray diffraction studies show that at room temperature $[(\text{CH}_3)_2\text{NH}_2]_3\text{Bi}_2\text{I}_9$ (DMAIB) is isostructural with $\text{Cs}_3\text{Sb}_2\text{I}_9$. The crystals are orthorhombic, space group Pnam with unit cell parameters $a = 22.565$, $b = 15.549$ and $c = 9.088$ Å, $Z = 4$, $V = 3188$ Å³. Observations under a polarizing microscope at room temperature show that DMAIB crystal is ferroelastic. The ferroelasticity can be explained as a consequence of a hexagonal to orthorhombic 6/mmmFmmm phase transition. The successive structural phase transitions in DMAIB were studied by dielectric and DSC methods and polarizing microscope observations. DMAIB undergoes four transitions at 304 K (I $\Rightarrow$ II), 285 K (II $\Rightarrow$ III), 230 K (III $\Rightarrow$ IV) and 195 K (IV $\Rightarrow$ V). The I $\Rightarrow$ II and II $\Rightarrow$ III transitions are of first order while the III $\Rightarrow$ IV and IV $\Rightarrow$ V are of second order. The III $\Rightarrow$ IV transition is not revealed by DSC while the IV $\Rightarrow$ V is not observed in a $\Rightarrow_\alpha(T)$ plot. The successive stages of the ferro-paraelastic (II $\Rightarrow$ I) transition are shown in polarizing microscope photographs. The II-I phase boundary forms a 46 ± 0.5 deg. angle to the [001] direction of the low-temperature orthorhombic phase.

Słowa kluczowe

Dielectric, ferroelasticity, halogenobismuthate, phase transitions

Adres publiczny

<https://doi.org/10.1080/01411599008206897>