Structure and Phase Transitions of some Crystals containing $\left[(CH)_3NH2\right]^+$ and $MeCl_4$

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Results of our investigation of crystal structure and phase transitions of some crystals containing a bivalent metal, chlorine anion, and dimethylammonium (DMA) cations are reported. Studies of the crystals are of great interest, since data of the crystal structure of this compound are very scarce and mechanisms of phase transitions in them are not available. It was establish that the crystal were grown from solution with copper chlorides have the composition [(CH₃)₂NH₂]₂CuCl₄[(CH₃)₂NH₂]Cl and, in room temperature are describes by orthorhombic space group $Pna2_1$. The structure of the crystals is built of CuCl 4 tetrahedral, three structure nonequivalent DMA groups, and individual chloride ions, which are links via an extended hydrogen bond system into three-dimensional framework. The unit cell parameters are measure as function of temperature. The crystals undergo jump-wise phase transition into incommensurate modulated phase at 279 K and commensurate modulated phase at 253 K, respectively. The result of our studies demonstrated that the crystals obtained from solution containing cadmium were grown in orthorhombic system [(CH₃)₂NH₂]₅Cd₃Cl₁₁ as well as monoclinic system [(CH₃)₂NH₂]CdCl₄. The temperature curves of unit cell parameter and the vicinity of phase transition are reported. At room temperature $[(CH_3)_2NH_2]CoCl_4$ belong to the $P2_1/c$ space group and have ferroelectric properties in the temperature range 227-260 K. The crystals of this family has complicated system of hydrogen bonds and are a great interest because of ordering of hydrogen bonds and changes in cation dynamics pay an important role in the processes of phase transitions.

Russian Foundation supported this study for Basic Research, project no.03-02-16190

Keywords: crystal structure, phase transition, ferroic