$[NH_2CHNH_2]_3Sb_2I_9$: a lead-free and low-toxicity organic–inorganic hybrid ferroelectric based on antimony(III) as a potential semiconducting absorber.

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Streszczenie

We report the physicochemical characteristics of a novel Sb-based formamidinium ferroelectric material, $(NH_2CHNH_2)_3Sb_2I_9$ (**FAIA**). **FAIA** crystallizes at room temperature in the hexagonal $P6_3mc$ space group. The crystal structure of**FAIA** is isomorphic to that of its bismuth analog, $[NH_2CHNH_2]_3Bi_2I_9$ (**FAIB)**, which is characterized by a zero dimensional (0D) anionic network (discrete bioctahedral units). From the DSC results three phase transitions (PT) have been found for **FAIA**: at 187.4/189 K (phase **I** ↔ phase **II**), 177.6/177.9 K (**II** ↔ **III**) and 148.2/152.3 K (**III** ↔ **IV**). The compound exhibits ferroelectricity in the room temperature phase **I** and in the successive temperature phases (**II** and **III)**. The spontaneous polarization (P_S = 0.5 × 10^{-2} μC cm^{-2}) reversibility has been confirmed by the presence of the ferroelectric hysteresis loops and pyroelectric measurements. The origin of ferroelectricity is discussed in terms of the cationic dynamics. This material may be considered as a semiconductor ($\sigma \sim 10^{-6}$ S m^{-1}, 300 K).

Adres publiczny

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