Dynamics of ferroelectric bis(imidazolium)pentachloroantimonate(III) by means of nuclear magnetic resonance ^{1}H relaxometry and dielectric spectroscopy.

Autorzy

Anna Piecha-Bisiorek

Ryszard Jakubas

Wojciech Medycki

M. Florek-Wojciechowska

M. Wojciechowski

Danuta Kruk

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Streszczenie

Some of haloantimonates(III) and halobismuthates(III) are ferroelectric. Bis(imidazolium) pentachloroantimonate(III), $(C_3N_2H_5)_2SbCl_5$ (abbreviation: **ICA**) is the first example of such compounds with a one-dimensional anionic chain which exhibits ferroelectric properties. The relation between the ionic dynamics and network structure and the ferroelectric features is not clear. Here Nuclear Magnetic Resonance (NMR) ^{1}H spin–lattice relaxation experiments at 25 MHz are reported for **ICA** in the temperature range of 80 K-360 K, covering ferroelectric-paraelectric and structural phase transitions of the compound occurring at 180 and 342 K, respectively. The relaxation process is biexponential in the whole temperature range indicating two dynamically nonequivalent types of imidazolium cations. Temperature dependences of both relaxation contributions allow for identifying three motional processes. Two of them are cation-specific – *i.e*. they are attributed to the two types of imidazolium cations, respectively. The third process involves both types of cations, and it is characterized by much lower activation energy. Moreover, the relaxation data (combined with ^{1}H second moment measurements) show that the ferroelectric-paraelectric phase transition mechanism is governed, to a large extent, by the anionic network arrangement. The NMR studies are complemented by dielectric spectroscopy experiments performed in the vicinity of the Curie temperature, T_C = 180 K, to get insight into the mechanism of the ferroelectric-paraelectric phase transition. The dielectric dispersion data show critical slowing down of the macroscopic relaxation time, τ, in **ICA** when approaching T_C from the paraelectric side, indicating an order–disorder type of ferroelectrics.