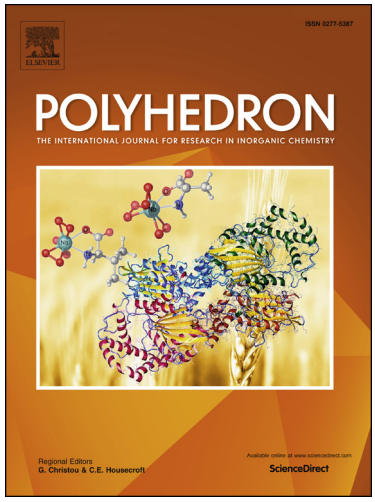

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The structural phase transition in a hybrid layered perovskite: $[C_7H_{16}N]_2[SnI_4]$

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Abstract

We investigated the synthesis and structural phase transition of a two-dimensional layered perovskite-type organic−inorganic hybrid compound, (cyclohexylmethylammonium)$_2$SnI$_4$. By systematic characterizations, we found that this compound undergoes a reversible first-order phase transition from the high-temperature space group *Cmca* to the low-temperature space group $P2_1/c$ at around T_c = 319 K. Accompanying the phase transition, dielectric bistability ~~and potential ferroelasticity~~ was also detected. The phase transition is ascribed to the order−disorder transition of the cyclohexylmethylammonium cations. It is known, the interesting electronic and optical properties in the two-dimensional Sn (II) and Pb (II) halide perovskite structures are dominated by the inorganic part. The phase transition and related physical properties observed in this work arise from the organic parts. This will enrich the chemistry of the hybrid structures by tailoring the organic moieties, and accordingly, may lead to novel multifunctional materials such as ferroelectric materials.

Key words: Structural phase transition; Dielectric anomaly; Order-disorder; Symmetry breaking; organic–inorganic hybrid compound

1. Introduction

In recent years, organohalide perovskites of Sn(II) or Pb(II) have attracted a lot of interest[1] for their intriguing properties ranging from optical and photovoltaic properties[2-8] to ferroelectric properties[8, 9]. These compounds are self-organized crystals possessing diverse structure from zero-dimensional (0D) to three-dimensional (3D) networks.[10-13] Among them, the 2D layered perovskites have been widely studied because these crystals exhibit a variety of appealing features