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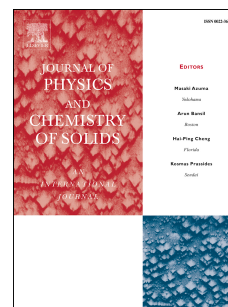
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Structure, thermal, and impedance study of a new organic–inorganic hybrid
 $[(\text{CH}_2)_7(\text{NH}_3)_2]\text{CoCl}_4$

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Abstract

$[(\text{CH}_2)_7(\text{NH}_3)_2]\text{CoCl}_4$ crystallizes in the triclinic system, space group P-1 with two molecules per asymmetric unit cell ($Z = 2$). The unit cell dimensions are $a = 7.3107$ (2) Å, $b = 10.1841$ (3) Å, $c = 11.2690$ (4) Å, $\alpha = 66.81(2)^\circ$, $\beta = 78.85(12)^\circ$, and $\gamma = 87.66(2)^\circ$. The unit cell volume and the calculated density are 756.11 (4) Å³ and 1.463 Mg m⁻³, respectively. The structure of the hybrid is characterized by alternating layers of inorganic $[\text{CoCl}_4]^{2-}$ anion and heptane diammonium cation. The organic hydrocarbon layers are packed in a stacked herring-bone manner with hydrogen bonds to the halide ions. The lattice potential energy U_{pot} and the cation molecular volume V^+ are 1856.2 kJ/mol and 0.37 nm³, respectively. DSC showed a compound (broad) peak at $T_1 = 331$ K, $T_2 = 328$ K with total entropy $\Delta S = 36.2$ J/K. mol, and a λ -like endothermic peak at $T_3 = 296$ K ($\Delta S = 24.9$ J/K. mol). Dielectric properties are investigated at different temperatures and frequencies [260 K $< T < 360$ K and 0.06 kHz $< f < 60$ kHz, respectively]. Super-linear power law is observed for the AC conductivity, which is analyzed based on the jump relaxation model.

Key words: Conductivity; Dielectric constant; Phase transition; X-ray crystal structure.

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