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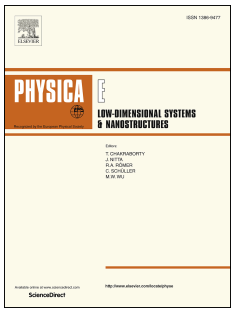

Synthesis, electrical properties, and conduction mechanism of $[N(CH_3)_4]_2PdCl_4$ compound

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Synthesis, electrical properties, and conduction mechanism of $[N(CH_3)_4]_2PdCl_4$ compound

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Abstract

$[N(CH_3)_4]_2PdCl_4$hybrid compound was synthesized and studied by X-ray powder diffraction patterns, differential scanning calorimetry (DSC), and impedance spectroscopy. It is crystallized at room temperature in the tetragonal system with P4/mmm space groupand the refined unit cell parameters are a=b = 8.831 Å, c= 11.415 Å. Four phase transitions at T_1=348K, T_2=398K, T_3=462K and T_4=472K were detected by DSC measurements and confirmed by the variation of f_p, σ_g and σ_{dc} as a function of temperature. The equivalent circuit was attributed based on the Z-View software, and the (AC) electrical conduction in $[N(CH_3)_4]_2PdCl_4$ was determined by two processes based on Elliot's theory: non-overlapping small polaron tunneling model (NSPT) in phase I and IV and the correlated barrier hopping model (CBH) in phase II and III.

Keywords: Hybrid material, Phase transition, electrical properties, conduction mechanism.

I.Introduction

Organic–inorganic hybrid materials have received considerable interest as they offer the opportunity to combine useful properties of the organic and inorganic components within a singlecomposite **[1]**.These hybrid materials of the general formula A_2MX_4 (A: organic cation, M: metal= Co, Cu, Zn, Hg, Cd, Pt, Pd and X: halogen= Cl, Br and I) have attracted significant attention thanks to their multiple phase transitions related to the dynamics of the organic cations and inorganic anions. The interest in these compounds is rapidly increasing as some of them exhibit remarkable structural and physical properties like ferro-electricity, ferro-elasticity and low dimensional magnetism **[2-4]**.As a consequence there has been a concerted