# Dielectric Permittivity and AC Conductivity Investigation for the New Model Lipid Bilayer Material: $(CH_2)_{10}(NH_3)_2CdCl_4$

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Differential thermal scanning of the new lipid-like bilayer material $(CH_2)_{10}(NH_3)_2CdCl_4$ showed two structural phase transitions, with onset temperatures at $T_2$ = (359 ± 2) K and $T_1$ = (415± 1) K. Permittivity measurements were performed between room temperature and 450 K at 60–100 kHz. A step-like rise in permittivity at $T_2$, associated with an order-disorder transition, is attributed to chain melting. Two anomalies at (413 ± 1) K and (430 ± 3) K, showing thermal hysteresis of ~ 8 and 10 K, respectively, indicate first order transitions which are associated with crystalline phase change.

The AC conductivity follows an Arrhenius-type relation with the activation energy $\Delta E$ varying with the frequency $f$ according to the relation $\Delta E = \Delta E_0\,[1 - \exp(f_0/f)]^{\alpha}$, where $\Delta E_0$, $f_0$ and $\alpha$ are 0.95 eV, 52 Hz and 0.11, respectively. The frequency dependent conductivity follows the power law $\sigma = \sigma_{dc} + B\omega^s$, with $0.3 < s < 1.5$ for hopping conduction of hydrogen and/or chloride ions in the high temperature range, and localized hopping and/or orientational motion predominating temperatures lower than 413 K. Variations of B and s with temperature are discussed. PACS No. 76, 77

*Key words:* Phase Transitions; AC Dielectric Permittivity; Two-dimensional Materials; Lipid Bilayers.