Possibility of a New Ferroelectric Relaxor in the Layered Magnetic Insulator $[(CH_2)_3(NH_3)_2Cu_{1-x}Cd_xCl_4]$, x = 0, 0.3, 0.6, and 1

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The dielectric permittivity of the layered magnetic insulators $[(CH_2)_3(NH_3)_2Cu_{1-x}Cd_xCl_4]$ with $x = 0$, 0.3, 0.6, and 1 has been studied in the temperature range 300 K – 470 K at different frequencies. Single crystal- and powder-measurements for $x = 0$ revealed a ferroelectric phase transition at (434 ± 2) K. The ferroelectric Cu crystal and the antiferroelectric Cd salt were found to form solid solutions in the range $0.3 < x < 0.6$. The permittivity results of samples with $x = 0.3$ and 0.6 showed the broad permittivity-temperature plateau typical of dielectric relaxors. The two samples follow the relationship $1/\varepsilon - 1/\varepsilon_m = (T - T_m)^\gamma/C$, with $\gamma = 1.75$ and 1.71 and $C = 4.13 \cdot 10^5$ K and $1.19 \cdot 10^5$ K for $x = 0.3$ and $x = 0.6$ samples, respectively. Anomalous change in the temperature variation of the permittivity ($\delta\varepsilon'/\delta T$) for the $x = 1$ sample at $T \sim 374$ K is ascribed to a structural phase transition. Thermal analysis for the $x = 0$ sample reveals two phase changes at $T_1 = 434.4$ K and $T_2 = 334.5$ K. The T_1 transition confirms the ferroelectric transformation, and the transition at T_2 is related to an order-disorder phase change. — PACS #:81.05.-t, 77.22.-d

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