



Variable-range hopping conductivity in $\text{Cu}_2\text{ZnGeSe}_4$ single crystals

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Abstract

Resistivity, $\rho(T)$, of the $\text{Cu}_2\text{ZnGeSe}_4$ single crystals is investigated between $T \sim 10$ and 300K . The Mott variable-range hopping (VRH) conductivity is observed in the temperature interval of $\sim 80\text{--}230\text{K}$. Analysis of the Mott VRH conductivity yields the values of the semi-width of the acceptor band, $W \approx 13\text{--}15\text{meV}$, the relative acceptor concentration, $N_A/N_c \approx 0.86\text{--}0.89$, at the critical concentration of the metal–insulator transition, $N_c \approx 6.3 \times 10^{18}\text{cm}^{-3}$, the values of the localization radius, $a/a_B \approx 7\text{--}9$ with the Bohr radius $a_B \approx 13.5\text{\AA}$, the mean acceptor energy $E_0 \approx 82\text{meV}$ and the mean density of the localized states, $g \approx (1.7\text{--}2.1) \times 10^{17}\text{meV}^{-1}\text{cm}^{-3}$.