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Power-law Current-Voltage Characteristics of Charge-Ordered Organic Crystals θ-(BEDT-TTF)$_2$MZn(SCN)$_4$ (M=Cs, Rb) YAMAGUCHI TAKAHIDE, TAKAKO KONOIKE, KENGO ENOMOTO, MITSUKA NISHIMURA, TAICHI TERASHIMA, SHINYA UJI, National Institute for Materials Science, Japan, HIROSHI M. YAMAMOTO, RIKEN(The Institute of Physical and Chemical Research), Japan — We have measured the current-voltage characteristics of charge- ordered organic crystals θ-(BEDT-TTF)$_2$MZn(SCN)$_4$ (M=Cs, Rb) in a low current range down to 10^{-13} A. The current-voltage characteristics follow the power law $I \propto V^a$ with a large exponent (e.g., $a = 8.4$ at 0.3 K for M=Cs) over a wide range of currents. The power-law characteristics are attributed to electric field-induced unbinding of electron- hole pairs which are thermally excited in the background of the two-dimensional charge order. From analysis of crossover electric fields from ohmic to the power-law characteristics, we obtain strong evidence that the electron-electron Coulomb interaction is significantly long-ranged, i.e., the screening length is greater than 10 molecule sites. A novel magnetoresistance effect, possibly due to the Pauli exclusion principle, is also presented.

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