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Effect of randomness on dielectric property in dimer-type organic salts MAKOTO NAKA, RIKEN CEMS, SUMIO ISHIHARA, Department of Physics, Tohoku University — Electronic ferroelectricity is known as phenomena where electric polarization is attributed to charge order without inversion symmetry. Organic material kappa-$(ET)_2Cu_2(CN)_3$ is a candidate of the electronic ferroelectric material. The ET molecule dimers are arranged on a two dimensional triangular lattice. Recently, a dielectric anomaly is experimentally observed around 30K. An origin of this anomaly is supposed to be electronic dipoles generated by asymmetric electronic charge distribution in the ET dimers. The observed broad peak structure and dispersion in the dielectric constant suggest that a relaxor-like state is realized in this material. Motivated by these experimental results, we study theoretically effects of randomness on dielectric properties in a dimer-Mott insulator. We analyze an low-energy effective model where electric dipoles inside the ET molecules interact with each other under random electric field. This model is analyzed by using the cluster mean-field approximation. With increasing the random field, phase transition occurs from a ferroelectric charge ordered phase to a charge glass phase. This transition is first- (second-) order in low (high) temperature. A tricritical point exists on the transition line. In the charge glass phase near the tricritical point, the dielectric susceptibility shows broad peak structure. We also find a spin-charge glass phase due to the random electric field and spin-charge coupling.

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