Remarkable Temperature Dependence of Time-Resolved Photoresponse in Electrical Conductivity of Deuterated κ-(BEDT-TTF)2Cu[N(CN)2]Br

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Abstract : The time-resolved photoresponse in the electrical conductivity of single crystals of deuterated κ-(BEDT-TTF)2Cu[N(CN)2]Br, κ-*d*8-Br, has been measured at various temperatures by using a nanosecond laser pulse with application of a weak electric field. Upon photoirradiation, the conductivity of κ-*d*8-Br increases, which depends remarkably on temperature and corresponds well to the phase transitions. As the temperature decreases from 70 to 30 K, where antiferromagnetic (AF) spin fluctuation is observed, the photocurrent increases monotonically and reaches a maximum at 30 K. With further decreasing the temperature below 30 K, where both the metallic phase and the insulator phase appear and the AF spin fluctuation is depressed, the photocurrent monotonically decreases and reaches a constant at ∼15 K, at which an antiferromagnetic transition occurs. The fact that the photoirradiation effect was not observed at temperatures above the glass transition temperature suggests that the photoinduced change in electrical conductivity results from the photoactivated intramolecular motion of the ethylene end groups of th e BEDT-TTF molecules.

*J. Phys. Chem. C*, 2012, **116 (32)**, pp 17182–17187

<https://doi.org/10.1021/jp305966j>

ACS Publication