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Large drop in dielectric constant at ferrimagnetic ordering of CoCr₂O₄ thin film as observed by terahertz time domain spectroscopy¹ K.R. MAVANI, M. NAGAI, M. SHIRAI, K. TANAKA, Dept. of Physics, Kyoto University, D.S. RANA, I. KAWAYAMA, M. TONOUCHI, Inst. of Laser Engr., Osaka University — Multiferroic spinel CoCr₂O₄ shows ferrimagnetic transition at \sim 95 K and, at further low temperatures, it shows development of magnetic spin spirals simultaneous to a ferroelectric transition. We have deposited epitaxial CoCr₂O₄ thin film on MgO(100) substrate and studied the film using temperature dependent terahertz (THz) time-domain spectroscopy. There is a large drop in the dielectric constant (ε_1) to nearly half of its initial value at ferrimagnetic transition of CoCr₂O₄ thin films in the THz frequency range. This is contrary to few earlier studies by capacitance measurements which showed no significant change in the dielectric constant (ε_1) at ferrimagnetic transition [1]. At lower temperatures, two dielectric anomalies were observed in the temperature dependent ε_1 , which correspond to the onset of short-range magnetic spin spirals (~ 50 K) and the long-range ordering of the spirals at lower temperature (~ 26 K). Our results indicate a magnetoelectric effect at the ferrimagnetic transition of CoCr₂O₄ thin film in THz frequency range. [1] G. Lawes et al., Phys. Rev. B 74, 24413 (2006).

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