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Electric field manipulation of room temperature ferromagnetism in anatase $\mathbf{Ti_{1-x}Co_xO_{2-\delta}}$ YOSHINORI YAMADA, Tohoku University, KAZUNORI UENO, TOMOTERU FUKUMURA, HONGTAO YUAN, University of Tokyo, HIDEKAZU SHIMOTANI, Tohoku University, YOSHIHIRO IWASA, University of Tokyo, LIN GU, SUSUMU TSUKIMOTO, Tohoku University, YUICHI IKUHARA, MASASHI KAWASAKI, University of Tokyo — Ferromagnetic semiconductor is one of the most attractive materials for semiconductor spintronics because of the controllability of both charge and spin degrees of freedom. Electric field effect of magnetism in the ferromagnetic semiconductors such as (Ga,Mn)As has been demonstrated only at low temperature due to their low Curie temperatures. In this study, we report the electric field manipulation of ferromagnetism in a ferromagnetic semiconductor $Ti_{1-x}Co_xO_{2-\delta}$ at room temperature [1]. Anatase $Ti_{1-x}Co_xO_{2-\delta}$ (001) epitaxial film was deposited on TiO_2 buffer 5 nm / $LaAlO_3$ (100) substrate in various oxygen pressures in order to vary an electron density by pulsed laser deposition method. An electric double layer transistor was fabricated on a paramagnetic film with an electron density of 1x10^{19} cm^{-3}. With increasing gate voltage, the electron density was increased to 7x10^{19} cm^{-3}. Ferromagnetic hysteresis loop was observed for V_G above 3.0 V in an anomalous Hall resistivity, which is proportional to a magnetization of the film. This result represents that the ferromagnetism was induced at room temperature by an electrostatic charge accumulation, indicating that the ferromagnetism in this compound is mediated by the electron carriers.

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[1] Y. Yamada et al., Science **332**, 1065 (2011).

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