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Photo-controlling electrical properties of graphene-based field-effect transistor with photo-reactive copolymer CHI-YUAN LIN, Department of Photonics and Institute of Electro-Optical Engineering,National Chiao Tung University,Taiwan, FOREST SHIH-SEN CHIEN, Department of Physics, Tunghai University, Taiwan, CHEN-SHIUNG CHANG, Department of Photonics and Institute of Electro-Optical Engineering,National Chiao Tung University, CHIA-CHEN HSU, Department of Physics, National Chung-Cheng University, Taiwan — Here, we presented a photo-controlling graphene-based FET device. The tri-stable current of graphene device can be achieved in room temperature using the photo-assisted poling (PAP) and photo bleaching (PB) on photo-reactive copolymer PMMA-DR1. PMMA-DR1 was used as a dielectric film between graphene and top gate, where the top gate was the ITO film for applied voltage and excited laser passing. PAP operation created a polarization of PMMA-DR1 film, while the current of graphene FET device was varied due to Fermi energy of graphene was directly influenced by the polarization. The strength of polarization was associated with the gate voltage and laser power during the process of PAP operation. In contrast to the PAP operation, the PB operation was able to destroy the polarization of PMMA-DR1 film, while the current of graphene FET device returned to the initial value. Combing with PAP and PB operations, three current states identified as 1, 0 and -1 states can be achieved in room temperature. The current change ratios were 150% and 50% for 1 state and -1 state, comparing with initial state 0.

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