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Semiconducting graphene nanoribbon fabricated by gate-controlled, edge-selective photo-oxidation of graphene. MORIHIRO MATSUMOTO, RYO NOUCHI, Nanoscience and Nanotechnology Research Center, Osaka Prefecture University, Sakai 599-8570, Japan — Graphene is attracting much attention for its ultrahigh carrier mobility, and is expected as the next generation material which makes high speed communication possible. However, since graphene has no bandgap, its conductivity cannot be turned completely off. Thus, pristine graphene cannot be used as a transistor in logic applications, where high on/off current ratios are required. It is known that narrow graphene nanoribbons with nanometer-scale widths show semiconducting characteristics with sufficiently large bandgap [1]. In this presentation, we propose and demonstrate a new method to fabricate graphene nanoribbons at room temperature in air. We have found that ultraviolet(UV)-induced photochemical reactions can be controlled by a configuration of a field effect transistor, and graphene edges are selectively photo-oxidized by the UV irradiation under a negative gate voltage and a finite drain voltage [2]. By means of this gate-controlled, edge-selective photo-oxidation, we succeeded to improve the on/off ratio from 2.7 to 43 at room temperature. [1] Y. W. Son, M. L. Cohen, and S. G. Louie, Phys. Rev. Lett. **97**, 216803 (2006). [2] N. Mitoma and R. Nouchi, Appl. Phys. Lett. **103**, 201605 (2013).

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