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Heteroepitaxial Graphene on a Si Substrate Field-Effect Transistor ROMAN OLAC-VAW, Electrical Engineering Department, University at Buffalo, Buffalo, NY USA, HYUN CHUL KANG, TSUNEYOSHI KOMORI, TATAYUKI WATANABE, HIROMI KARASAWA, YU MIYAMOTO, HIROYUKI HANDA, HIROKAZU FUKIDOME, Research Institute of Electrical Communication, Tohoku University, Sendai, Japan, TETSUYA SUEMITSU, MAKI SUEMITSU, JST-CREST, Japan Science and Technology Agency, Tokyo, Japan, VLADIMIR MITIN, Electrical Engineering Department, University at Buffalo, Buffalo, NY USA, TAIICHI OTSUJI, JST-CREST, Japan Science and Technology Agency, Tokyo, Japan — Electronic and optoelectronic properties of the graphene-backgate transistor are presented. Our transistor was fabricated on graphene film heteroepitaxially formed by the thermal decomposition on the surface of 3C-SiC grown on a Si substrate by organo-silane gas source molecular beam epitaxy. The film consists of a few graphene layers. Although some gate leakage current is observed, the experimental results show that our device works as an n-type transistor as well as an infrared photovoltaic transistor. The graphene channel saturated current is on the order of mA/mm. The estimated effective mobility has its maximum over 6000 $cm^2/(Vs)$. The photo-responsivity can be achieved up to mA/W. The backgate voltage tuning spectral characteristic is also observed. Heteroepitaxial graphene is a promising material for post-Si CMOS applications.

Vladimir Mitin
Electrical Engineering Department, University at Buffalo, Buffalo, NY USA

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