Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Formation of Graphene field Effect Devices with Periodic Uniaxial Strain and Its Semiconducting Electron Transport HIKARI TOMORI, Division of Physics and TIMS, University of Tsukuba and PRESTO-JST, RINEKA HIRAIDE, YOUITI OOTUKA, AKINOBU KANDA, Division of Physics and TIMS, University of Tsukuba — Strain engineering is a promising but unexplored method of inducing band gaps in graphene. So far, a band gap in graphene induced by periodic uniaxial strain has been observed in scanning tunnel spectroscopy studies, while it has not been confirmed in actual field effect devices. This missing gap is presumably due to the relaxation of strain in device fabrication processes. Here, we develop a novel device fabrication method which makes graphene largely strained even after the formation of electrical contacts. The back gate voltage dependence of the conductance in the strained graphene exhibits remarkable difference from the conventional V-shaped curve observed in graphene placed on SiO2. The minimum conductivity shows thermal activation behavior at high temperatures. From the Arrhenius plot, the band gap is estimated to be 2.4 meV. Besides, the current-voltage characteristics become nonlinear around the origin. The high resistance region extends in a region of +/- 2 meV around the charge neutrality point, which agrees with the band gap estimated from the temperature dependence. These observations confirm the formation of the band gap in our strained graphene. We expect that optimization of the device structure extends the gap and improves device performance.

Hikari Tomori
Division of Physics and TIMS, University of Tsukuba

Date submitted: 07 Jan 2017 Electronic form version 1.4