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Direct observation of asymmetric band structure of bilayer graphene through quantum capacitance measurements KAORU KANAYAMA, KOSUKE NAGASHIO, TOMONORI NISHIMURA, AKIRA TORIUMI, The University of Tokyo — Although upper conduction and valence sub-bands in bilayer graphene are known to be asymmetric, a detailed analysis based on the electrical measurements is very limited due to the infirm quality of gate insulator. In this study, the electrical quality of the top-gate Y_2O_3 insulator is drastically improved by the high-pressure O_2 post-deposition annealing at 100 atm and the carrier density of $\sim 8*10^{13}$ cm^{-2} is achieved. In quantum capacitance measurements, the drastic increase of the density of states is observed in addition to the van Hove singularity, suggesting that the Fermi energy reaches upper sub-band. At the same carrier density, the sudden reduction of the conductivity is observed, indicating that the inter-band scattering occurs. The estimated carrier density required to fill the upper sub-bands is different between electron and hole sides, i.e., asymmetric band structure between upper conduction and valence bands is revealed by the electrical measurements.

Kaoru Kanayama
The University of Tokyo

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