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Local modulation of carrier density in graphene-ferroelectric field effect transistors through flexoelectric switching[1] ANNA GURA, HSIANG C. HSING, MOHAMMED YUSUF, XU DU, MATTEW DAWBER, State Univ of NY- Stony Brook — We use a ferroelectric (FE) material to harness the electric functionalities of graphene (Gr) by engineering Gr-FE Field Effect Transistors. In these devices, the underlying FE superlattice layer is used to control the charge state of the Gr channel. By using artificially layered FE superlattices and optimizing parameters during growth and Gr deposition, we have obtained ideal interfaces that result in hysteretic devices. However, our successful devices using $PbTiO_3/SrTiO_3$ as the FE layer display a shift of the gating and C-V curves towards positive gate voltages, making the polarization state unstable. We believe this is caused by ordered structural defects that arise during growth of the superlattice. To overcome this obstacle we have designed a hybrid superlattice system consisting of $PbTiO_3/SrTiO_3/PbTiO_3/SrRuO_3$ alternating layers. In these samples the C-V measurements are centered on 0V, providing retention of the polarization state without any applied compensation bias and enabling non-volatile polarization switching as a result of strain applied by an AFM Tip. We studied local changes in conductivity of the Gr and demonstrate the use this technique to design re-writable circuit elements on the graphene-FE hybrid devices.

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Anna Gura
State Univ of NY- Stony Brook

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