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**Patterning nanoroads and quantum dots on fluorinated graphene**

MORGANA RIBAS, Rice University, ABHISHEK SINGH, Indian Institute of Science and Rice University, PAVEL SOROKIN, BORIS YAKOBSON, Rice University — Graphene nanoroads [1] and quantum dots [2] patterned on functionalized graphene combine metallic and semiconducting properties on a same mechanically intact sheet. Using density functional methods we investigate different stoichiometric phases of fluorinated graphene and find that the complete “2D-teflon” CF phase is thermodynamically more stable. The formation of fluorinated graphene favors the nucleation of aromatic “magic” clusters, but unlike hydrogenated graphene [3] it does not have a nucleation barrier. The CF is an insulator and turns out to be a perfect matrix-host for patterning nanoroads and quantum dots of pristine graphene. Depending upon the edge orientation and width the electronic and magnetic properties of the nanoroads can be tuned. The HOMO-LUMO energy gaps are size dependent and show a typical confinement of Dirac fermions. Furthermore, we study the effect of different coverage of F on graphene (CF and C<sub>4</sub>F) on the band gaps, and show their suitability to host quantum dots of graphene with unique electronic properties. References: [1] Singh, A. K.; Yakobson, B. I., Nano Lett. 2009, 9 (4), 1540.[2] Singh, A. K.; Penev, E. S.; Yakobson, B. I., ACS Nano 2010, 4 (6), 3510. [3] Lin, Y.; Ding, F.; Yakobson, B. I., Phys. Rev. B 2008, 78 (4), 041402.

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