T GZNRS oral

Quantum transport in exfoliated graphene on ultrathin crystalline β-Si3N4

Sedighe Salimian,1 Shaohua Xiang,1 Stefano Colonna,2 Fabio Ronci,2 Marco Fosca,2 Francesco Rossella,1 Fabio Beltram,1 Roberto Flammini2, and Stefan Heun1

1 NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Piazza San Silvestro 12, 56127 Pisa, Italy 2 CNR-ISM Istituto di Struttura della Materia, Via del Fosso del Cavaliere 100, 00133 Roma, Italy

We present the first experimental report on the transport properties of graphene devices on ultrathin-Si3N4. Our study provides a quantitative understanding of the physics of ultrathin Si3N4 as a gate for graphene-based devices. The Si3N4 ultrathin film was grown on Si(111) under UHV conditions and investigated by scanning tunneling microscopy (STM). Subsequently, an exfoliated graphene flake was deposited on top of it by a PMMA–based transfer technique. A Hall bar device was fabricated from the graphene flake. STM was again employed under UHV conditions to study the graphene flake after device processing, showing that its surface quality is preserved. Back gate modulation of the carrier type and density in the graphene channel, weak localization, and tunneling across the dielectric are observed in magneto-transport measurements at 4.2 K. Experimental data of tunnel current due to back gate modulation as a function of temperature is discussed in terms of the Poole-Frenkel and Fowler-Nordheim mechanisms.

Salimian Sedighe
NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore
Nest Laboratory
Piazza San Silvestro 12, Pisa, Italy
56127/ Pisa
Italy
+39-050-509.123
sedighe.salimian@sns.it