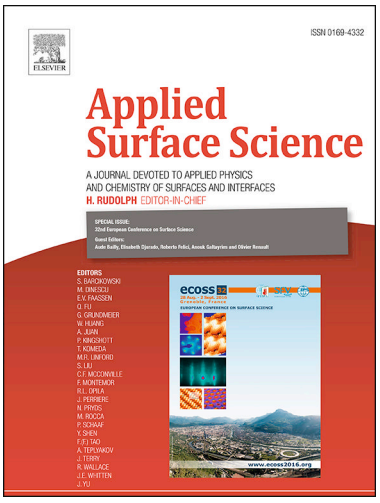

Full Length Article

State memory in solution gated epitaxial graphene

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State memory in solution gated epitaxial graphene

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We studied electrical transport in transistors fabricated on a surface of high quality epitaxial graphene with density of defects as low as $5 \cdot 10^{10}$ cm^{-2} and observed quasistatic hysteresis with a time constant in a scale of hours. This constant is in a few orders of magnitude greater than the constant previously reported in CVD graphene. The hysteresis observed here can be described as a shift of ~+2V of the Dirac point measured during a gate voltage increase from the position of the Dirac point measured during a gate voltage decrease. This hysteresis can be characterized as a nonvolatile quasistatic state memory effect in which the state of the gated graphene is determined by its initial state prior to entering the hysteretic region. Due to this effect the difference in resistance of the gated graphene measured in the hysteretic region at the same applied voltages can be as high as 70%. The observed effect can be explained by assuming that charge carriers in graphene and oppositely charged molecular ions from the solution form quasistable interfacial complexes at the graphene interface. These complexes likely preserve the initial state by preventing charge carriers in graphene from discharging in the hysteretic region.

1. Introduction

The high carrier mobility (~250000 $cm^2/(V\ s)$) [1], ballistic transport, two dimensional nature, and high chemical stability of graphene make it a promising candidate for various