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The Role of Surfactant Adsorbates on Hysteresis and Carrier Mobility in Graphene Transistors CHIH-JEN SHIH, GERALDINE PAULUS, QING HUA WANG, ZHONG JIN, MOON-HO HAM, DANIEL BLANKSCHTEIN, MICHAEL STRANO, Massachusetts Institute of Technology, MIT TEAM — Understanding the role of polar and ionic adsorbates on the transport characteristics of graphene transistors is important for the development of graphene-based sensor devices and printable electronics using graphene solutions. We have investigated the effects of commonly used surfactants for graphene dispersion in aqueous solution on transport characteristics of graphene transistors. The adsorbates are found to transfer electrons to graphene, scatter carrier transport, and induce more electron-hole puddles when the graphene is on an SiO_2 substrate. We relate the change in transport characteristics to specific properties of a series of anionic, cationic, and neutral surfactants using a modification of a self-consistent transport theory. To understand the effects of surfactant adsorbates trapped on either side of the graphene, suspended devices were fabricated. Strong hysteresis is observed when both surfaces were exposed to the surfactants, attributable to their function as charge traps. This work is the first to demonstrate the control of hysteresis, allowing us to eliminate it for sensor and device applications or enhance it for non-volatile memory applications.

Chih-Jen Shih
Massachusetts Institute of Technology

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