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A novel method for measuring electrical conductance in thin solid films that is insensitive to contact effects TAMAR MENTZEL, MOUNGI BAWENDI, MARC KASTNER, Massachusetts Institute of Technology — The synthesis of novel materials has been a primary driver in the emerging fields of organic-based electronics and nanoelectronics. One major obstacle to the research and development of novel materials is the ability to electrically characterize the material without introducing a significant contact resistance or damaging the material. In organic materials, the contact material has been found to alter the morphology of and to penetrate into the organic molecules, to form Schottky barriers, and to be thermally and mechanically unstable. Throughout nanoelectronics, unstable contacts and large contact resistances arise because of the reduced contact area as devices shrink in size. I will present a novel method for measuring electrical conductance in thin solid films that is insensitive to contact effects. In place of standard current measurements, a nanoscale metal-oxide-semiconductor field-effect transistor (MOSFET) is used to sense charge diffusion in a thin film of amorphous germanium. The contact resistance between the amorphous germanium and a pair of gold electrodes can be modulated *in situ* without affecting the conductance measurement. Moreover, our technique enables the measurement of conductance as low as 10^{-19} S with application of only 1 V to the film. This method can be used to electrically characterize any thin film which is sensitive to contact effects or where the resistance is too high to measure with conventional methods.

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