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Substrate-Dependent Electronic Behavior of Polydiacetylene Nanowires RAJIV GIRIDHARAGOPAL, K. F. KELLY, Rice University — Scanning tunneling microscopy (STM) has been used to study individual polydiacetylene (PDA) nanowires. STM analysis of PDA nanowires on different substrate electrode materials at varying sample bias voltage conditions reveals interesting substrate-dependent effects. PDA nanowires were formed on both graphite and molybdenum disulfide (MoS_2) substrates. Interestingly, the nanowires on graphite appear with different topographic heights depending on the substrate bias voltage, and the height varies substantially with respect to voltage polarity. A similar effect is observed on MoS_2 at negative sample bias voltages, except that the nanowires are almost twice as tall on MoS_2. Even more intriguing is that at positive sample bias voltage conditions, the nanowires on MoS_2 are invisible in all STM images. A comparison of these voltage-dependent effects points to a strong influence of the substrate electrode material on the electronic behavior of these polymer nanostructures. The results reported here have implications for recently-demonstrated technologies such as monolayer PDA transistors and PDA-based organic solar cell devices as well as potential molecular electronic systems.

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