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Semiconducting transport characteristics of monolayer graphene through substrate-induced functionalization PO-HSIANG WANG, Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan, LO-YUEH CHANG, National Synchrotron Radiation Research Center, Taiwan, FU-YU SHIH, Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan, PO-HSUN HO, Department of Materials Science and Engineering, National Taiwan University, Taiwan, CHIA-HAO CHEN, National Synchrotron Radiation Research Center, Taiwan, CHUN-WEI CHEN, Department of Materials Science and Engineering, National Taiwan University, Taiwan, WEI-HUA WANG, Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan — We report semiconducting transport behaviors of monolayer graphene functionalized through chemically reactive substrates. In contrast to pristine graphene, graphene on activated SiO_2/Si substrates exhibits a transport gap at cryogenic temperature, nonlinear transfer characteristics, and insulating transport behaviors. Raman spectroscopy was performed to provide evidence of sp^3 hybridization of graphene and confirms the presence of chemical bonding in the graphene samples. Moreover, we observe hopping transport characteristics at cryogenic temperature. Our study points toward an alternative method to control the functionalization of graphene and its transport behaviors.

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