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Atomic Scale Transport in Graphene on Stepped SiC(0001) Surfaces SHUAIHUA JI, JAMES B. HANNON, RUUD M. TROMP, ARTHUR W. ELLIS, MARK C. REUTER, FRANCES M. ROSS, IBM T. J. Watson Research Center, Yorktown Heights, NY — Thermal decomposition of SiC is a promising route to wafer-scale epitaxial graphene. However, the initial SiC surface contains steps, and graphene formation induces additional steps. Here we consider how these steps affect current transport in graphene. 1-2ML graphene was grown by annealing SiC above 1300°C in disilane. Low energy electron microscopy was used to determine graphene thickness, and transport through 1ML thick regions was measured by scanning tunneling potentiometry. In this technique a bias is applied between two fixed probes while a third, scanning probe measures the local electrochemical potential as well as topography. This allows us to determine the resistivity of the graphene sheet on terraces and across substrate steps. Single steps with 0.5nm height show very weak scattering. However, multiple steps of height 1.0 and 1.5nm scatter strongly, exhibiting a potential drop equivalent to ∼80nm and 120nm respectively of terrace graphene. Thus, step bunching is important, and steps separated by less than a few hundred nm can dominate transport through a graphene sheet.

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