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Multi-Layer Epitaxial Graphene Formed from Poly-Crystalline Silicon Carbide Grown on C-Plane Sapphire[1] TIMOTHY MCARDLE, JACK CHU, YU ZHU, ZIHONG LIU, MAHADEVAIYER KRISHNAN, CHRIS BRESLIN, CHRISTOS DIMITRAKOPOULOS, ROBERT WISNIEFF, ALFRED GRILL, IBM T. J. Watson Research Center, Yorktown Heights, NY — Growth of epitaxial graphene on substrates as large as eight inches in diameter is of great interest for integration with current CMOS technology. We use ultra-high vacuum chemical vapor deposition to grow poly-crystalline silicon carbide (SiC) on c-plane sapphire wafers, which are then annealed at high temperature in vacuum to create multi-layer epitaxial graphene films. Despite the roughness and small domain size of the poly-crystalline SiC films, a thick, conformal layer of graphene is formed. Reducing the surface roughness by chemical-mechanical polishing the SiC surface prior to the anneal results in a dramatic reduction of the Raman defect band observed in the final graphene film. Additionally, the graphene formed on polished SiC demonstrates significantly more ordered layer-by-layer graphene growth and increased carrier mobility for the same carrier density as the unpolished samples.

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