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Ultrathin epitaxial graphite layers : 2D electron gas properties and a route towards graphene based nanoelectronics CLAIRE BERGER, ZHIMIN SONG, TIANBO LI, XUEBIN LI, ASMEROM OGBAZGHI, RUI FENG, ZHENTING DAI, ALEXEI MARCHENKOV, EDWARD CONRAD, PHILLIP FIRST, WALT DE HEER, Georgia Tech — Nanopatterned ultrathin epitaxial graphite structures have been produced by thermal decomposition on single crystal SiC and conventional lithographic techniques. The films, composed of less than 5 graphene sheets, show remarkable 2D electron gas properties. Large positive magnetoconductances and large magnetoconductance anisotropy, indicate that orbital effects dominate the magnetotransport. Shubnikov de Haas oscillations have been observed as well as a pronounced zero-bias anomaly in low-temperature current versus voltage spectra. The films have been gated by applying potentials to gate electrode structures. These results and the control of the nanographite structure suggest nanoelectronic device applications, and a route towards realizing the device potential of nanographite, predicted to be comparable to carbon nanotubes.

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