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Artificial Graphene in Nano-patterned GaAs Quantum Wells[1]
SHENG WANG, DIEGO SCARABELLI, Department of Applied Physics, Columbia University, YULIYA Y. KUZNETSOVA, Department of Physics, Columbia University, LOREN N. PFEIFFER, KEN WEST, Department of Electrical Engineering, Princeton University, GEOFF C. GARDNER, MICHAEL J. MANFRA, Department of Physics and Astronomy, and School of Materials Engineering, and School of Electrical and Computer Engineering, Purdue University, VITTORIO PELLEGRINI, Istituto Italiano di Tecnologia, Graphene Labs, Genova, Italy and NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa, Italy, SHALOM J. WIND, Department of Applied Physics, Columbia University, ARON PINCZUK, Department of Physics and Department of Applied Physics, Columbia University
— We report the realization of artificial graphene (AG) in a 2D electron gas in a highly tunable semiconductor quantum well system. Very short period (as small as 40 nm) honeycomb lattices were formed in a GaAs heterostructure by electron beam lithography followed by dry etching. Characterization of the AG samples by photoluminescence at low temperature (about 4K) indicates modulation of 2D electron states. Low-lying electron excitations observed by resonant inelastic light scattering and interpreted with a calculated AG band structure confirm the formation of AG bands with a well-defined Dirac cone, evidence for the presence of massless Dirac fermions. These results suggest that engineered semiconductor nano-scale structures can serve as advanced quantum simulators for probing novel electron behavior in low dimensional systems.

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Sheng Wang
Columbia Univ

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