Tunable negative magnetoresistance in hydrogenated graphene

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Abstract

The problem of unconventional magnetism in materials without d and f electrons has attracted continuous attention. In particular, a lot of efforts have been devoted to understanding the origin and effects of magnetic moments induced in graphene with structure defects such as missing carbon atoms, absorption of light atoms such as hydrogen or fluorine. We have measured the magnetoresistance (MR) of graphene at low temperature with in-situ hydrogenation in ultra-high vacuum environment. The evolution of weak localization and weak anti-localization provide strong evidence that hydrogenation of graphene has introduced local magnetic moment in the electron system, and have substantially increase the spin-orbit interaction of the sample. Large and non-saturating negative MR was also found in hydrogenated graphene which could be tuned by carrier density and sample temperature.

Short Biography

Dr. Jian-Hao Chen obtained his PhD in Physics under the supervision of Prof. Ellen Williams at University of Maryland at College Park, Maryland, United States in 2009. Thereafter, he worked as a Research Fellow in the nanoelectronics group of Prof. Michael Fuhrer at University of Maryland and in Prof. Alex Zettl’s group at University of California at Berkeley. Since March 2013 he joined Peking University as an Associate Professor and Principle Investigator of the Laboratory for Nanoelectronics and In-Situ Quantum Transport. His present research is focused on studying the physics and applications of low-dimensional electronic materials and its nanostructures, manipulation of material properties at the atomic scale, and in-situ quantum electrical transport in ultra-high vacuum environment. His peer-reviewed publications include three articles in Nature Physics, one article in Nature Nanotechnology and three articles in Physical Review Letters, with a total SCI citation of more than 4000.