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Pseudo-spin Winding Number in Hydrogenated Graphene KEYAN BENNACEUR, Physics dpt, McGill, JONATHAN GUILLEMETTE, Physics dpt & Electrical and Computer Engineering dpt McGill, PIERRE L. LEVESQUE, Chemistry dpt, Universit de Montral, FARZANEH MAHVASH, Electrical and Computer Engineering dpt, McGill & Chemistry dpt, UQAM, CYRIL PROUST, LNCMI (CNRS-INSA-UJF-UPS), MOHAMED SIAJ, Chemistry dpt, UQAM, RICHARD MARTEL, Chemistry dpt, Université de Montréal, GUIL-LAUME GERVAIS, Physics dpt, McGill, THOMAS SZKOPEK, Electrical and Computer Engineering dpt, McGill — The quantum Hall effect (QHE) has been previously observed in highly resistive hydrogenated graphene, with an estimated hydrogen coverage up to 0.1% that is sufficient to impart strongly insulating behaviour in zero magnetic field [1]. The opening of an impurity induced gap in graphene upon hydrogenation is anticipated to break local sub-lattice symmetry, and it may thus alter the Berry phase of Shubnikov-de Haas (SdH) oscillations and lead to a different Landau level (LL) sequence. Here we report the observation of SdH oscillations in a magnetic field up to 55 Tesla in graphene samples hydrogenated to different degree. The low temperature electron mobility ranges from $\sim 1 \ cm^2/V.s$ to $\sim 1000 \ cm^2/V.s.$ Analysis of SdH oscillation frequency in 1/B indicates that the LL sequence remains four-fold degenerate. We also observe the $\nu = 2$ Hall plateau in all samples. We therefore conclude that the topological part of the Berry phase, meaning the pseudo-spin winding number that determines the LL sequence [2], is preserved in hydrogenated graphene.

[1] J. Guillemette et al, PRL 110, 176801 (2013).

[2] J.N Fuchs et al Eur. Phys. J. B 77, 351-362 (2010).

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