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Dirac fermions as a cause of unusual Quantum Hall Effect in Graphene[1]

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The graphite films with a single atomic layer of carbon (graphene) have the low-energy "relativistic-like" quasiparticle excitations which can be described by two-dimensional Dirac equation. It is demonstrated that due to the Dirac-like character of carriers the quantization of the Hall conductivity is unusual: it occurs at half-integer filling factors. In addition, the phases and amplitudes of the de Haas - van Alphen and Shubnikov de Haas quantum magnetic oscillations in graphene differ drastically from the patterns observed in a more conventional materials with a parabolic dispersion.

[1]In collaboration with V.P. Gusynin.