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Long, 140 ns electron spin lifetime in chemically synthesized graphene and related nanostructures and its strong interplay between the surface bound oxygen

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The electron spin lifetime in an assembly of chemically synthesized graphene sheets was found to be extremely long at room temperature but also extremely sensitive to oxygen. Introducing small concentrations of physisorbed O_2 onto the graphene surface reduced the exceptionally long 140 ns electron spin lifetime by an order of magnitude. This effect was completely reversible: Removing the O_2 by dynamic vacuum restored the spin lifetime. The presence of covalently bound oxygen also decreased the electron spin lifetime in graphene, although to a far lesser extent compared to physisorbed O_2. The conduction electrons in graphene were found to play a significant role by counter-balancing the spin depolarization caused by oxygen molecules. Our results highlight the importance of chemical environment control and device packing in practical graphene based spintronic applications.

Biography

Bálint Náfrádi obtained a PhD in 2004 in Physics from the EcolePolytechniqueFédérale de Lausanne under the supervision of Prof. LászlóForró. He then worked as a Postdoctoral Fellow with Professor Bernhard Keimer at the Max Planck Institute for Solid State Research in Stuttgart, Germany. He obtained the Fellowships for prospective researchers of the SNSF. Since 2011 he is a scientist at the Institute of Condensed Matter Physics of Ecolepolytechniquefédérale de Lausanne. His research interest involves spintronics and quantum magnetism. He is also interested in carbon nanomaterials and organic-inorganic halide perovskites.

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