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Room-temperature ferromagnetism in graphite driven by two-dimensional networks of point defects KEES FLIPSE, Eindhoven University of Technology, Eindhoven, The Netherlands, JIRI CERVENKA, Academy of Sciences, Czech republic, MISHA KATSNELSON, Radboud University of Nijmegen, The Netherlands — Understanding the mechanism of ferromagnetism in carbon-based materials, which contain only s and p electrons in contrast to traditional ferromagnets based on 3d or 4f electrons, is challenging. Here, we demonstrate direct evidence for ferromagnetic order locally at defect structures in highly oriented pyrolytic graphite (HOPG) with magnetic force microscopy and in bulk magnetization measurements at room temperature. Magnetic impurities have been excluded as the origin of the magnetic signal. The observed ferromagnetism has been attributed to originate from localized electron states at grain boundaries of HOPG, forming two-dimensional arrays of point defects. The theoretical value of the magnetic ordering temperature based on weak interlayer coupling and/or magnetic anisotropy is comparable to the experimental value. The unusual chemical environment of defects bonded in graphitic networks can reveal the role of the s and p electrons, creating new routes for spin transport in carbon-based materials.

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