

Abstract Submitted
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Can Carbon Be Ferromagnetic? HENDRIK OHL DAG, SLAC National Accelerator Center, PABLO ESQUINAZI, University Leipzig, ELKE ARENOHOLZ, Lawrence Berkeley National Laboratory, DANIEL SPEMANN, MARTIN ROTHERMEL, ANNETTE SETZER, TILMAN BUTZ, University Leipzig — The existence of long range magnetic order at room temperature in carbon based structures without magnetic elements is very unexpected. Theoretical results from different groups suggest that the existence of long range magnetic order in a graphite structure is possible, if one takes the effects of defects and/or the incorporation of hydrogen atoms into account. SQUID results provided first systematic hints for the existence of magnetic order at room temperature in virgin as well as irradiated highly oriented pyrolytic graphite (HOPG) samples. We present a x-ray dichroism study of graphite surfaces [1] that addresses the origin and magnitude of ferromagnetism in metal-free carbon. Using element specific x-ray microscopy we can show that metallic impurities do not play a role in the ferromagnetism of carbon and that carbon can be ferromagnetic without ferromagnetic impurities. A detailed spectroscopic study shows that in addition to carbon *pi*-states, also hydrogen-mediated electronic states exhibit a net magnetization with magnetic remanence at room temperature. The observed magnetism is restricted to the top ~ 10 nm of the sample where the actual magnetization reaches a value similar to classic ferromagnetic materials like e.g. Nickel. [1] H. Ohldag et al., Phys. Rev. Lett. **98**, 187204 (2007) and submitted to NJP (2010)

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