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Magnetization measurement of highly oriented pyrolytic graphite surface with a spin-polarized metastable helium beam SHIRO ENTANI, MITSUNORI KURAHASHI, YASUSHI YAMAUCHI — Magnetic ordering in nanometerscale graphitic materials has attracted much interest in recent years. Some theoretical studies have predicted that the origin of ferromagnetism in these materials was attributed to defects in graphitic structures, such as edges and topological defects. Employing surface analytical technique is favorable for elucidation of these predictions by experimental studies, because there exist a number of pores and steps at the graphite surface and the structure not in an equilibrium phase might be realized at a surface state. In this work, we have successfully detected the magnetization in highly oriented pyrolytic graphite (HOPG) surface using a spin-polarized metastable helium (He*) beam under high magnetic field up to 5 T. The He* beam is an extremely surface-sensitive probe and the surface magnetization can be analyzed by measuring the asymmetry of sample current induced by the He* spin direction [1]. The observed value of the asymmetry shows a clear temperature dependence and is much larger than that of magnetic impurities measured by Auger electron spectroscopy. Thus, we could conclude that this surface magnetism is an intrinsic property of the HOPG itself other than the diamagnetism.
[1] M. Kurahashi and Y. Yamauchi Rev. Sci. Instrum. 77, 023904 (2006).

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