Room-temperature proximity-induced Anomalous Hall Effect in Graphene Coupled to A Ferromagnetic EuO

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Abstract

Graphene has emerged as a potential candidate in exploring the exciting field of spintronic as it can transport spin information with high efficiency. It has a long spin diffusion length at room temperature and can control the degree of freedom of spin through the spin relaxation mechanism. When kept in proximity to a ferromagnetic material like EuO a large spin polarization has been predicted [1] opening the way to various interesting phenomenon and new spintronic device concepts [2]. In this work we describe the experimental efforts which includes the growth of magnetic Europium Oxide magnetic thin film by an original Molecular Beam Epitaxy method, and their structural and magnetic characterizations. Finally, we present transport measurements revealing Anomalous Hall effect in Graphene in proximity with EuO thin film. Two types of magnetic order are observed where a transition occurs from a ferromagnetic (FM) behaviour to a superparamagnetic (SPM) like behaviour when increasing the temperature. Surprisingly, a large SPM signal survives up to room temperature which could make possible new spintronic applications in graphene.

References

[1] H. X. Yang, A. Hallal, D. Terrade, X. Waintal, S. Roche, and M. Chshiev, PHYSICAL REVIEW LETTERS 110, 046603 (2013)
[2] D. A. Solis, A. Hallal, X. Waintal, and M. Chshiev, PHYSICAL REVIEW B100, 104402 (2019)
[3] Dmitry V. Averyanov, Ivan S. Sokolov, Andrey M. Tokmachev, Oleg E. Parfenov, Igor A. Karateev, Alexander N. Taldenkov, and Vyacheslav G. Storchak, *ACS Applied Materials & Interfaces* (2018) *10* (24), 20767-20774
[4] Thomas Mairoser1 , Julia A. Mundy2, Alexander Melville3, Daniel Hodash3, Paul Cueva2, Rainer Held3, Artur Glavic4, Ju¨rgen Schubert5, David A. Muller2,6, Darrell G. Schlom3,6 & Andreas Schmehl1, DOI: 10.1038/ncomms8716 (2015)

Figures

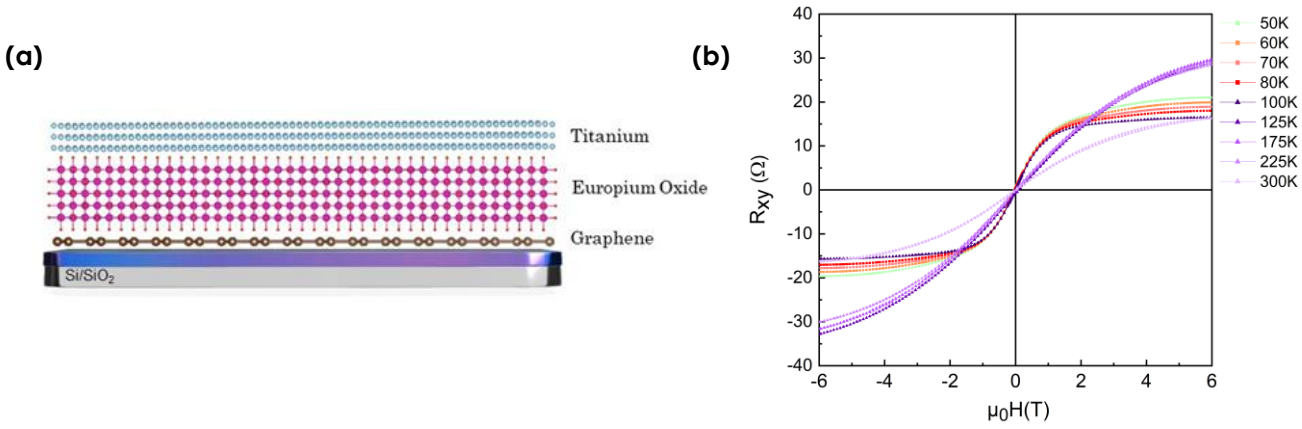

Figure: (a) Sketch of Graphene/EuO heterostructure. **(b)** Magneto-transport measurements – $R_{xy}(H)$ curves at different temperatures.