



Postdoc Offer

Magnetism of carbon / 2D magnetic materials heterostructures

Laboratory: LPCNO-INSA Toulouse, 135 avenue de Rangueil 31077 Toulouse

Supervisors: Thomas Blon, Benjamin Lassagne

Graphene is a suitable atomically-thin 2D material to create proximity-induced effects when placed in heterostructures with materials as ferromagnets. To this end, ferromagnetic graphene/2D van der Waals heterostructures are very promising, as they combine the exceptional charge and spin transport properties of graphene with a 2D magnetic material in atomically flat layers.¹ Moreover, while graphene is intrinsically diamagnetic in nature due to a delocalized π -bonding network, ferromagnetic behaviors have been demonstrated when defects are introduced into its lattice, as indicated by numerous theoretical studies^{2,3} and confirmed by several experimental works.⁴

As a postdoctoral researcher, you will focus on magnetic measurements of ferromagnetic carbon-based and van der Waals materials using conventional magnetometry techniques and novel magnetotransport devices. The latter concerns micro-Hall graphene-based magnetic sensors manufactured at LPCNO, with very high sensitivities, superior to those of the latest semiconductor-based sensors.⁵ You will participate to the fabrication of such devices and on the measurement of intentionally defective carbon materials (graphene, carbon nanotube) and magnetic materials (2D ferromagnetic van der Waals, magnetic nanoparticle). Anomalous Hall effect measurements will also be used to detect magnetism directly in magnetic conducting 2D ferromagnets.

This work will be conducted within the frame of an ANR research program (LPCNO/LCC). The post-doc will interact with the different academic partners of the project, participate in the design, fabrication and characterization of the devices and communicate on the results.

Methods & Techniques

- Magnetism of thin films/nanostructures (required)
- Experience in magnetotransport measurement (desired)
- Experience in optical and electronic lithography (desired)
- Excellent organizational and scientific writing skills in English (required)
- Good communication skills (desired)

This position is a full-time temporary employment for 18 months.

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¹ B. Karpiak, A.W. Cummings, K. Zollner, M. Vila, D. Khokhriakov, A.Md Hoque, A. Dankert, P. Svedlindh, J. Fabian, S. Roche, S.P. Dash, *2D Mater.* 7 (2020) 015026

² O. V. Yazyev, *et al.*, *Phys. Rev. B* (2007) 75, 125408.

³ I. C. Gerber, *et al.*, *New J. Phys.* (2010) 12, 113021

⁴ O. V. Yazyev, *Rep. Prog. Phys.* (2010) 73, 056501.

⁵ B. T. Schaefer, *et al.*, *Nat. Commun.* (2020), 11, 4163.