New advances in two-dimensional spintronics using large-scale graphene

M. Venkata Kamalakar
Department of Physics and Astronomy, Uppsala University, Box 516, SE-751 20 Uppsala, Sweden
Venkata.mutta@physics.uu.se

Graphene is a key two-dimensional (2D) material today not only for spin current communication but also as an integration medium for 2D spin-charge interconversion and other complex 2D spintronic heterostructures. In such devices, contacts can lead to surface charge transfer doping, impacting the electrical properties of devices used to investigate spin transport in graphene. In addition, substrate roughness puts a limit on the spintronic performance of graphene channels. This presentation will highlight our results on device engineering to minimize contact-induced spin relaxation, leading to the observation of the highest spin parameters and the longest spin communication of 45 μm in graphene at room temperature [1]. Furthermore, realizing highly flexible ferromagnetic nanowires [2] allows us to realize flexible graphene spin devices [3], which show high diffusive spin transport in graphene, despite the rough topography of flexible substrates. These advances open up new opportunities for flexible-integrated large-scale 2D spintronic circuits, and innovative spin current components.

References

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