

High performance large-scale graphene pure spin circuits

M. Venkata Kamalakar

I. G. Serrano, Örjan Vallin, Olof Karis, Dibya Phuyal
Department of Physics and Astronomy,
Uppsala University, Box 516, SE-751 20
Uppsala, Sweden

Venkata.mutta@physics.uu.se

Due to its extraordinary electronic properties, graphene brought new impetus for planar spintronic circuits. Graphene is the best medium for spin-polarized electron transport, with spin transmission capability up to tens of microns at room temperature^{1,2}. Recent demonstrations have shown that it is possible to obtain large diffusion lengths of the order of tens of microns using high mobility schemes that employ graphene-hexagonal boron nitride heterostructures^{3,4}. While such structures have been realized in small-sized graphene crystals, there remains also a significant spread in the reported values and observations. For making systematic investigations or for practical applications, it is important to obtain high-performance spin propagation in wafer-scale graphene. Here, we unveil a demonstration to obtain spin diffusion lengths beyond 10 μm , in specially fabricated large-scale chemical vapor deposited graphene circuits³, that display very high spin diffusion up to 20 times larger than conventional CVD graphene devices. This new large scale high performance system holds potential to emerge as a universal platform for future scientific and technological advances in graphene spin based devices.

References

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