Novel Large-scale graphene spin valves

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Over the last one decade, Graphene has emerged as a material with extraordinary electronic properties, including an outstanding performance for spintronics. Graphene is the ideal medium for spin-polarized electron transport, due to its high mobility, an intrinsically low-spin orbit coupling and negligible hyperfine interaction, which led to its long-distance spin transmission capability[1,2]. Recent works have shown that achieving high mobility graphene using hexagonal boron nitride heterostructures for encapsulation, leads to large spin diffusion lengths ~ tens of microns[3,4]. While such structures have been realized in small-scale graphene crystals obtained by the mechanical exfoliation technique, there is also a significant spread in the reported values. One main ambition in graphene spintronics is to obtain reproducible, systematic and high-performance in large-scale graphene.

Here, we show high spin diffusion lengths beyond 10 µm, in specially fabricated large-scale chemical vapour deposited graphene circuits on novel large-scale substrates[5], unravelling the highest spin diffusion observed in large-scale graphene at room temperature. This advancement holds the potential to emerge as a standard platform for developing graphene spin based devices towards solid applications in future.

References

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