Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Seminar

Spin transport in graphene - hexagonal boron nitride van der Waals heterostructures

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Graphene, a one-atom thick two-dimensional layer of carbon atoms, has emerged in the last decade as a promise material for spintronics applications. In my talk, I will address the challenges in graphene spintronics due to the underlying substrate, impurities on graphene's surface and the quality of the ferromagnetic tunneling contacts. For this we introduce a new device geometry where graphene is fully encapsulated between two hexagonal boron nitride (hBN) layers.

Our results show that hBN provides a clean tunnel barrier-graphene interface enabling long distance spin transport in graphene. Furthermore, we show that it is possible to achieve spininjection and detection polarizations up to ±100% and a unique sign inversion of spin signals via application of electric field across the ferromagnetic tunneling contacts. We also employed large-area chemical vapour deposition (CVD) grown hBN as tunnel barriers and our study points to the importance of the quality and the crystallographic orientation of hBN in determining the tunneling characteristics.

Our results represent important developments towards understanding the nature of spin transport in graphene and spin injection via hBN barriers. This understanding will certainly be helpful in overcoming the challenges in realizing practical spintronic devices based on graphene-hBN van der Waals heterostructures.

Friday, May 18th 2018

10:00 AM (Tea/Coffee at 9:30 AM)

Seminar Hall, TIFR-H