Advances towards efficient and flexible two-dimensional spin circuits

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For exploring spin currents and building advanced spin current circuits, the new class of two-dimensional (2D) materials, that are atomically thin crystals with thickness ~few Å-nm, have emerged as promising systems. A classic example of such materials is graphene, where spin currents can travel over tens of microns at room temperature, up to hundreds of times longer than in typical metals. In graphene spintronic devices, contacts can lead to surface charge transfer doping, impacting the electrical properties of devices used to investigate spin transport in graphene. This talk will focus on our results on device engineering to minimize contact-induced spin relaxation, leading to the highest spin parameters and the longest spin communication of 45 µm at room temperature [1]. Furthermore, realizing highly flexible ferromagnetic nanowires [2] allow 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.

References

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