2D Materials and Devices

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In this talk I will review the recent progress on the application of atomically thin crystals different than graphene on optoelectronic devices. The current research of 2D semiconducting materials has already demonstrated the potential of this family of materials in optoelectronic applications [1-4]. Nonetheless, it has been almost limited to the study of molybdenum- and tungsten- based dichalcogenides (a very small fraction of the 2D semiconductors family). Single layer molybdenum and tungsten chalcogenides present large direct bandgaps (~1.8 eV). Alternative 2D semiconducting materials with smaller direct bandgap would be excellent complements to the molybdenum and tungsten chalcogenides as they could be used for photodetection applications in the near infrared. Furthermore, for applications requiring a large optical absorption it would be desirable to find a family of semiconducting layered materials with direct bandgap even in their multilayer form.

Here I will summarize the recent results on the exploration of novel 2D semiconducting materials for optoelectronic applications: black phosphorus [5-7], TiS_3 [8, 9] and franckeite [12]. Recent efforts towards tuning the optoelectronic properties of 2D semiconductors by strain engineering will be also discussed [10, 11].

References

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Figures

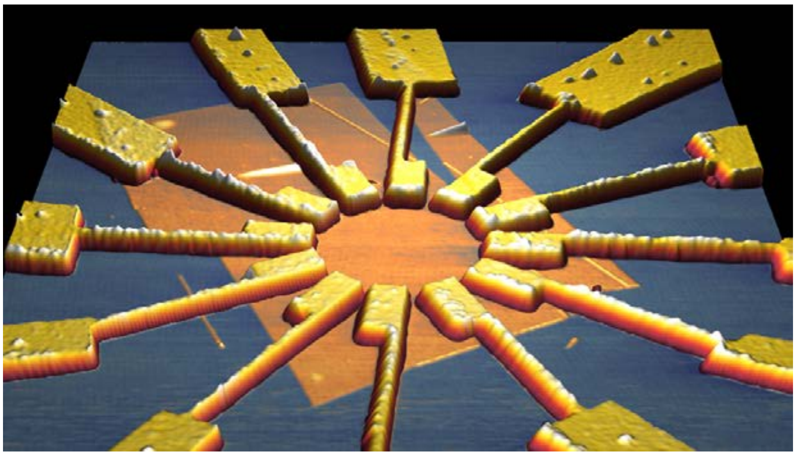

Figure 1: Atomic force microscopy image of a TiS_3 device with electrodes arranged at different angles to probe the in-plane anisotropy.