SEMINAIRE ISMO

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Probing interlayer coupling and valley contrasting properties in atomically-thin transition metal dichalcogenide-graphene heterostructures

Two-dimensional materials, such as transition metal dichalcogenides (TMD), graphene or boron nitride compose a unique toolkit of atomically-thin crystals with remarkable electronic, optical, spin and valley properties. These assets can possibly be enhanced by stacking 2D layers into so-called van der Waals heterostructures and thereby tailoring novel opto-electronic functionalities and devices. The performance of such devices is governed by near-field coupling through, e.g., interlayer charge and/or energy transfer. As a result, new concepts and experimental methodologies are needed to properly describe atomically sharp heterointerfaces in van der Waals heterostructures. During this seminar, I will introduce an original study of interlayer charge and energy transfer in a model 2D semiconductor-metal heterojunction [i.e., transition metal dichalcogenide (TMD)-graphene]. Using a combination of micro-photoluminescence (PL) and Raman scattering spectroscopies at variable temperature, we are able to disentangle contributions from slow photoinduced charge transfer phenomena and much faster (picosecond) energy transfer. As an outlook, I will discuss the implications of our results for opto-valleytronic applications in light of our recent studies of valley polarization and coherence in TMD-graphene heterostructures.

This work was done with E. Lorchat, Luis Parra-Lopez and G. Froehlicher at IPCMS; C. Robert, D. Lagarde, X. Marie at LPCNO (INSA Toulouse); S. Azzini, T. Chervy, T.W. Ebbesen and C. Genet at ISIS (Strasbourg).

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