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2D materials for optoelectronics and spin/valley-tronics

1. Organisateurs :

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2. Parrainage ou lien avec des sociétés savantes, des GDR ou autres structures :

GDR "HOWDI" : Hétérostructures de van der Waals de basse dimensionalité"

3. Résumé de la thématique du minicolloque :

Interest in 2D van der Waals materials is continuously rising owing to their fascinating electrical, optical and magnetic properties that are often very different from their 3D counterparts. The freedom offered by the stacking of these atomically thin layers makes these materials particularly promising to study a wealth of physical phenomena at interfaces (proximity effects, charge and energy transfer…) [1]

The library of 2D materials now extends far beyond pioneering graphene. For instance, semiconducting transition metal dichalcogenides (TMDs) (e.g. MoS_2, WSe_2 …) stand out for their strong light matter-interaction and the interplay between spin and valley degrees of freedom [2,3]. Hexagonal boron nitride (hBN) is an essential brick for any heterostructure due to its insulating properties. More recently, van der Waals 2D magnets (e.g. CrI_3, Fe_3GeTe_2, $FePS_3$, magnetic TMDs) emerged as a platform to study low-dimensional magnetism and to incorporate magnetic functionalities in complex heterostructures [4]. Various familes of 2D materials can thus be exploited for optoelectronics and spin/valley-tronics applications.

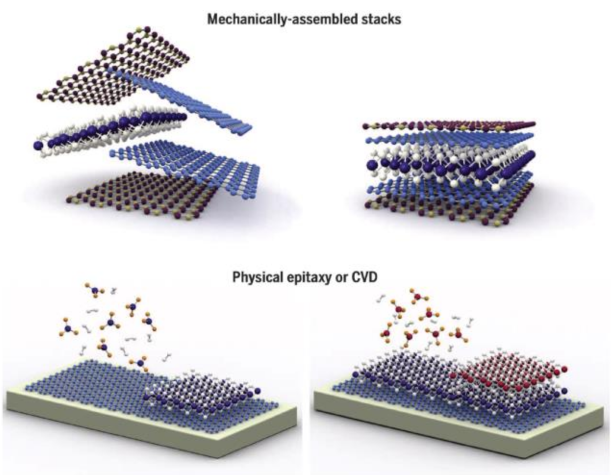

Figure 1. van der Waals heterostructures assembled by micromechanical transfer or bottom-up deposition methods [1].

Research in this field faces numerous challenges and opportunities regarding the elaboration (large-scale growth, processing), the nanoscale characterization (electrical, optical, etc.), the understanding of physical phenomena and the demonstration of emerging properties at van der Waals interfaces. This colloquium will be the opportunity to present the recent progress in this field and to foster interactions between the different communities studying 2D materials for optoelectronics and spin/valley-tronics, from material science to advanced measurements and realistic modelling.

Références

[1] K.S. Novoselov et al., Science 353, 461 (2016)
[2] Q.H. Wang et al., Nature Nanotechnol. 7, 699 (2012)
[3] T. Mueller and E. Malic, npj 2D Mater. Appl. 2, 29 (2018)
[4] M. Gibertini et al., Nature Nanotechnol. 14, 408 (2019)