Studying the properties of new 2D systems based on chalcogen materials elaborated by chemical methods on metal substrates

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THÈSE

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Amphithéâtre SOLEIL

Since the discovery of graphene, the number of two-dimensional (2D) materials has grown steadily. Each new 2D material demonstrated unusual physical properties offering a large flexibility in their tailoring for high-tech applications. In particular, the transition metal dichalcogenides family (TMDCs) is of interest, combining a transition metal (M) and chalcogen element (X), with generally a MX_2 stoichiometry. The great diversity of materials in this family makes them permanent research subjects, from experimental synthesis and characterization to simulation and theoretical modeling since the properties of TMDCs materials change depending on the transition metal and the chalcogen element but also on the preparation method. In this thesis, I present a new chemical deposition method allowing the formation of different forms of chalcogens-based materials according to the substrate: transition metal dichalcogenide $PtSe_2$ on Pt(111), 2D Cu-Te alloy layers on Cu(111) and on Cu(110), as well as a tellurene monolayer on Au(111) and on Au(110). Molecular Beam Epitaxy (MBE) method is also employed to produce some of these materials with the advantage of precise control of the film thickness. To probe their properties, I have benefited from the high-brilliant radiation of Synchrotron SOLEIL at TEMPO beamline and used various ultrahigh vacuum techniques, such as X-ray photoelectron spectroscopy (XPS), Angle-resolved photoemission spectroscopy (ARPES), Scanning tunneling microscopy (STM) and Low energy electron diffraction (LEED). In this work, I revealed very interesting structural and electronic properties of the $PtSe_2$, Cu-Te and tellurene materials. More importantly, I have demonstrated for the first time that these materials host 2D electron gas systems, which makes them very promising for applications in the nanotechnology industry.

Les membres du jury sont :

Marino MARSI	Professeur, Paris Saclay Université (LPS)	Président
Jean-Jacques GALLET	Maître de conférences (HDR), Sorbonne Université (UPMC)	Rapporteur
Mohamed ELLOUZE	Professeur, Sfax Université (FSS)	Rapporteur
Fredj HASSEN	Professeur, Monastir Université (FSM)	Examinateur
Yannick J. DAPPE	Chargé de recherche CNRS (HDR), (SPEC-CEA Saclay)	Examinateur
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Vous êtes cordialement invités au pot qui suivra

Formalités d'entrée : accès libre, limité à 40 personnes dans l'amphitheatre ou en visioconférence (lien envoyé sur demande)

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