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# Growth of Metallic TaSe<sub>2</sub> on GaP(111)<sub>B</sub> Substrates

C. Sthioul<sup>1†</sup>, Y. Chernukha<sup>1</sup>, H. Koussir<sup>1</sup>, C. Coinon<sup>1</sup>, G. Patriarche<sup>2</sup>, L. Thomas<sup>1</sup>, P. Roussel<sup>3</sup>, B. Grandidier<sup>1</sup>, P. Diener<sup>1</sup>, and X. Wallart<sup>1</sup>

<sup>1</sup>Univ. Lille, CNRS, Centrale Lille, Univ. Polytechnique Hauts-de-France, Junia-ISEN, UMR 8520 – IEMN, F-59000 Lille, France

<sup>2</sup>Univ. Paris-Saclay, CNRS, Centre de Nanosciences et de Nanotechnologies, 91120 Palaiseau, Paris, France

<sup>3</sup>Unité de Catalyse et de Chimie du Solide (UCCS), Univ. Lille, CNRS, Centrale Lille, Univ. d'Artois, UMR 8181 - UCCS, F-59000 Lille, France

<sup>†</sup>corentin.sthioul@univ-lille.fr

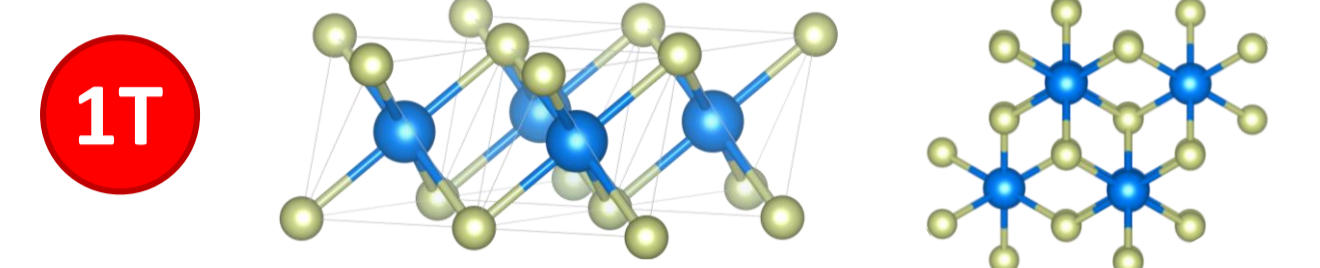
## Motivations

**Context:** TaSe<sub>2</sub> is a group V metallic transition metal dichalcogenide which also exhibits **charge density waves (CDW)**, superconductivity and **Mott insulating** states. Since the occurrence of these properties largely depends on the polytype, understanding the phase formation in TaSe<sub>2</sub> grown by **molecular beam epitaxy (MBE)** may be required for applications. However, the selective growth of 1T and 1H-TaSe<sub>2</sub> monolayers has only been demonstrated on graphene [1] and the phase diagram of few-layers TaSe<sub>2</sub> remains scarcely explored yet.

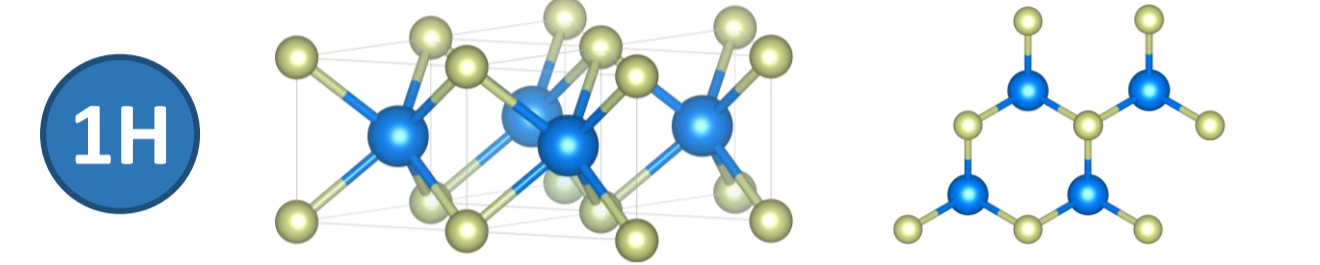
### Goals:

- Propose a commercially available III-V semiconducting substrate (gallium phosphide) which enables electrical characterisations.
- Investigate the growth of TaSe<sub>2</sub> multilayers and its possible use as high work function metallic contacts.

**1T-TaSe<sub>2</sub>**  
Mott insulator in monolayer  
CDW at room temperature



**1H-TaSe<sub>2</sub>**  
Always metallic  
CDW below 122K

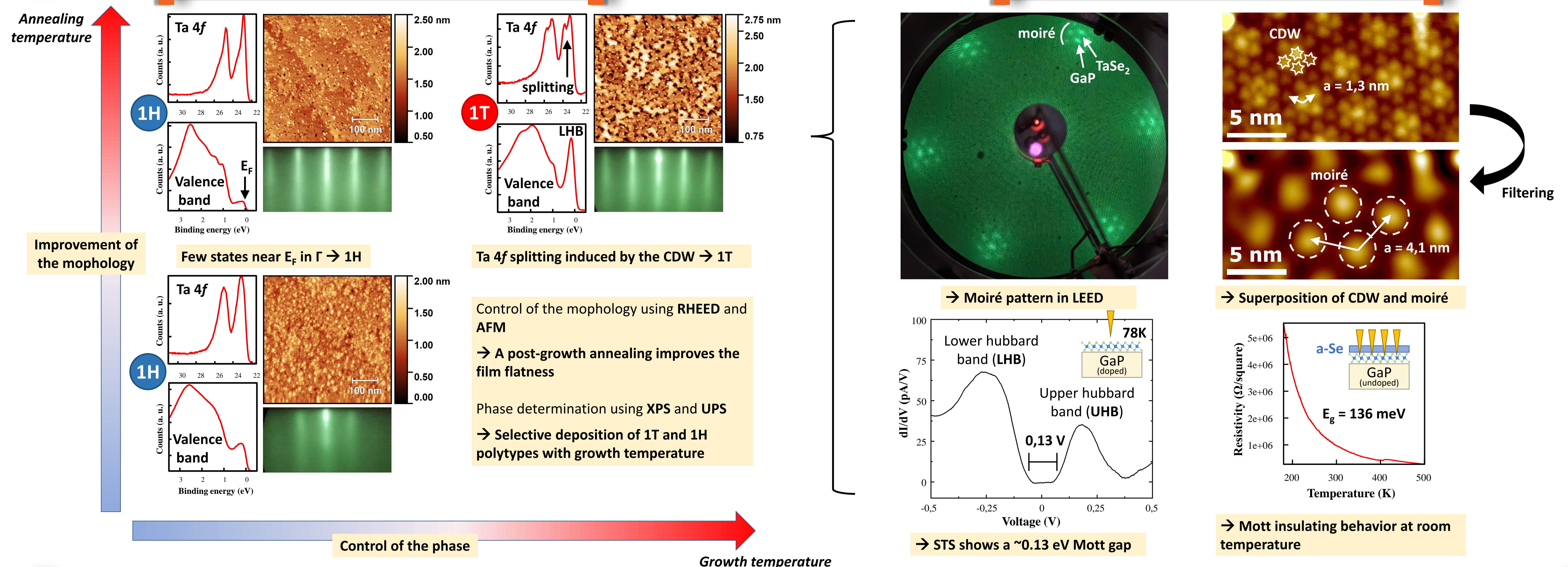


[1] Y. Nakata, T. Yoshizawa, K. Sugawara, et al. "Selective fabrication of Mott-insulating and metallic monolayer TaSe<sub>2</sub>". ACS Applied Nano Materials 1.4 (2018), pp. 1456–1460.

## Phase and morphology (XPS, UPS, AFM, RHEED)

## TaSe<sub>2</sub> monolayers

## Properties of 1T-TaSe<sub>2</sub> (LEED, STM, STS, 4-point probe)



## Phase and morphology (XPS, UPS, AFM, RHEED, STEM)

## TaSe<sub>2</sub> multilayers

## Structure (In-plane grazing-incidence XRD)

