Recent Advances in the Growth of Transition Metal Dichalcogenides by Thermally Assisted Conversion

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One of the simplest routes to the synthesis of transition metal dichalcogenides (TMDs) is the reaction of transition metal films with chalcogen precursors, oft referred to as thermally assisted conversion (TAC). This method is potentially scalable, affords control over layer thickness, and offers compatibility with standard semiconductor processing techniques[1].
In this presentation, recent advances in TAC growth of $PtSe_2$, and related materials, will be described. $PtSe_2$ can be grown at relatively low temperature and, like many other 2D materials, its electronic structure depends on layer thickness. While the material grown by this approach is polycrystalline in nature it has nonetheless shown promise for applications in areas such as sensing[2, 3] and (opto)electronics[4, 5]. Importantly, its relatively low growth temperature suggests compatibility with back-end-of-line (BEOL) processing.
A modified TAC approach for the synthesis of transition metal ditellurides will also be outlined. This entails the electrodeposition of Te layers onto transition metal films with subsequent conversion to TMD layers[6]. This approach allows for the synthesis of scarcely-studied TMDs including $PtTe_2$, which is a promising candidate for applications in electrocatalysis.

References

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Figures

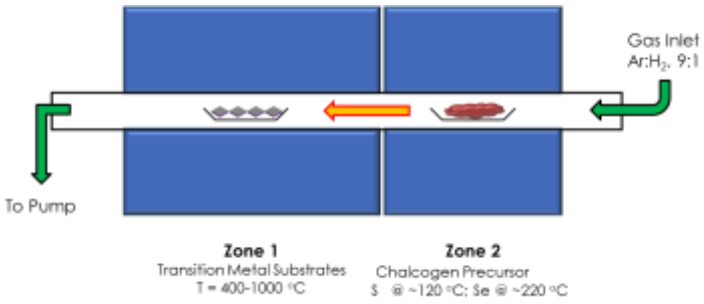

Figure 1: Schematic representation of standard TAC setup. The heating zones for transition metal films and chalcogen precursors are independently controlled

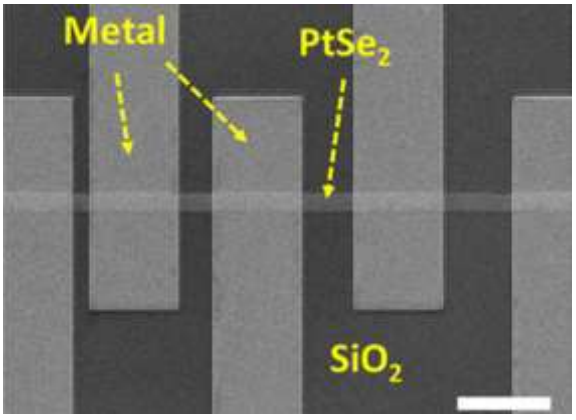

Figure 2: $PtSe_2$ channel defined by electron-beam lithography[5] (scale bar 5 μm)