

Synthesis and characterization of PtSe₂ thin films

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Platinumdiselenide (PtSe₂) is a layered group-ten transition metal dichalcogenide (TMD) with a number of remarkable properties. The bulk semimetal undergoes a transition to semiconductor with decreasing number of atomic layers. The few layered PtSe₂ possesses band gaps in the infrared region ideal for multiple applications. Further, PtSe₂ can be synthesized at low temperatures and has proven to be relatively air stable, both prerequisites for most applications.

In this study, we will outline the synthesis of PtSe₂ by thermally assisted conversion (TAC) of prepatterned Pt films [1]. Different methods of Pt deposition are analysed in order to achieve high quality PtSe₂ layers. The composition and morphology of the polycrystalline PtSe₂ films is investigated by Raman spectroscopy, X-ray photoelectron spectroscopy and scanning probe techniques. Achieving a high film quality is crucial in order to maximize the performance of devices such as chemical sensors [1], IR-Photodetectors [2] or pressure sensors [3].

References

- [1] C. Yim et al., ACS Nano, 10 (2016), 9550
- [2] C. Yim et al., Nano Lett, 3 (2018), 1794
- [3] S. Wagner et al., Nano Lett., 6 (2018), 3768

Figures

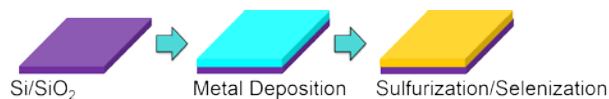


Figure 1: Direct sulfurization or selenization of pre-deposited transition-metal layers such as Platinum.

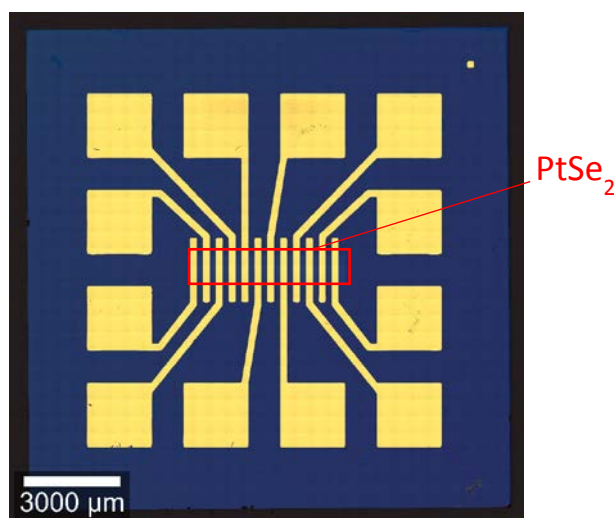


Figure 2: PtSe₂ based Gas sensor on a silicon chip. PtSe₂ channel in the center.