Direct growth of PtSe2 for integration of photonic devices

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Two-dimensional materials such as transition metal dichalcogenides (TMDs) are intensively investigated because of their potential applications in future electronics. Thickness dependent electronic and optical properties such metal-to-semiconductor transitions, high mobilities, and low temperature synthesis have moved the group 10 (Pt/Pd) TMDs or Nobel Metal Dichalcogenides (NMDs) to the center of attention. These layered materials have shown high potential for NEMS, optoelectronic devices and chemical sensors.
The low temperature synthesis of various polycrystalline TMDs is presented in this talk. [1] The composition and morphology of the grown films are investigated by several characterization techniques including Raman spectroscopy, SPM and X-ray photoelectron spectroscopy. Challenges in the understanding of the structure-property relationship of polycrystalline TMD films are discussed. The effects of growth parameters and underlying substrates on the film properties are investigated, to gain further understanding of the films. [2] The low temperature synthesis allows the back end of line (BEOL) integration compatible with silicon technology. [3] In this regard, examples for high performance chemical sensors, [1] IR-photodetectors[4] and MEMS[5] devices with PtSe2 will be presented

References

[1] Yim et al. ACS Nano, 10 (10), 9550 2016.
[2] Lukas et al., Advanced Functional Materials 31 (35), 2102929 2021
[3] Prechtl et al. Advanced Functional Materials 31 (46), 2103936 2021
[4] Yim, et al. Nano Letters, 3 (18), 1794 2018
[5] Wagner et al. Nano Letters, 8 (6), 3738 2018