Colloidal Synthesis of 2D-Pnictogens: Antimonene and Bismuthene

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The mono elemental 2D-materials based on allotropes from group 15, called *Pnictogens* (P, As, Sb, and Bi) have emerged as one of the most promising families of 2D-materials beyond graphene. 2D-Pnictogens have been highlighted as excellent candidates in a great variety of applications due to the outstanding properties that they exhibit, including layer-dependent bandgap, pronounced chemical reactivity, and strong spin-orbit coupling, to name a few. These 2D-materials can be isolated using top-down approaches, for instance, micromechanical and liquid-phase exfoliation. However, the utilization of top-down methods yielded unsatisfactory outcomes because of the challenging interlayer interactions present in the bulk material, hindering the large-scale production of high-quality material. [1,2] To overcome this challenge, a new bottom-up approach has been recently reported, involving a solution phase synthesis of well-defined hexagonal few-layer antimonene via anisotropic growth,[2] which has facilitated large-scale production of this material. In this context, we optimized the synthetic parameters for producing high-quality few-layer antimonene hexagons, and their implementation in a scalable process under continuous-flow conditions to pave the way for optoelectronic device fabrication.[3] Furthermore, we have recently developed a novel synthesis of anisotropic few-layer bismuthene hexagons based on colloidal chemistry showing outstanding electronic properties.[4,5] In this contribution, we will show the potential of the colloidal synthesis approach for the preparation of electronic-grade high-quality heavy 2D-Pnictogens.

References

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[5] Patent: ESP202130722.