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High-Mobility 2D Crystals: Controlled Synthesis and Functional Devices

The unique structure and properties of two-dimensional (2D) crystals have a large impact on fundamental research as well as applications in electronics, photonics, optoelectronics and energy sciences. Here our recent studies on the controlled synthesis of high-mobility 2D crystals such as graphene and layered bismuth oxychalcogenides (BOX, $\text{Bi}_2\text{O}_2\text{X}$: X = S, Se, Te), as well as their functional devices will be discussed. We achieved batch-fabrication of ultraclean graphene films and membranes towards their killer applications. In addition, novel air-stable ultrahigh-mobility semiconducting 2D BOX can be readily synthesized via chemical vapor deposition and fabricated into high-performance field-effect transistors and NIR photodetectors, in which pronounced quantum oscillations were also observed. Our studies suggest that high-quality 2D crystals hold great promise for future applications.

References

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