Towards integrated manufacturing of 2D materials

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The commercial potential of 2D materials hinges on the development of growth and integration techniques that are scalable and allow an adequate level of structural control. Chemical vapor deposition (CVD) now dominates the carbon nanotube market and rapid progress is being made to develop it also for the manufacture of graphene and other 2D materials. A key challenge thereby is to increase the level of structural growth selectivity and control. With a focus on diverse applications in the electronics and display industry, we are developing integrated process rationales for these nanomaterials that are informed by a fundamental understanding of the catalytic growth process.

This talk will focus on the scalable CVD of monolayer hexagonal boron nitride (h-BN) single crystals and our current understanding of the formation mechanisms of such compound 2D material on various catalyst systems [1,2]. Strategies for controlling the number of layers, stoichiometry, and crystal structure, i.e. domain size, connectivity, and orientation, will be compared to graphene CVD [3-5], and the potential of the direct CVD of various 2D heterostructures discussed. The talk thereby will also outline current challenges for integrated manufacturing and industrial device integration of these 2D materials [6].

References

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