CVD synthesis of few-layered h-BC_2N and optical applications

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Arranging carbon, boron, and nitrogen atoms in a sp^2 network can give rise to tailored electronic properties from insulators (*h*-BN) to metals (graphene)[1,2]. For semiconductor applications, the construction of a ternary structure (*h*-$B_xC_yN_z$) is highly desirable, but its uniform and large-area synthesis has remained a great hurdle. This challenge has been attempted by a fchemical vapor deposition method with a single molecular precursor, N-tri-methyl borazine where boron, carbon, and nitrogen atoms are covalently bonded, onto Ni catalysts in conjunction with the quenching method after the synthesis. The atomic structure closely resembles *h*-BC_2N as presented by XPS and nanometer resolution EELS mapping, and the photoluminescence and electroluminescence observed from the *h*-BC_2N film were in agreement, proving its well-established bandgap of 2.15 eV [3]. As optical application, the utilization of *h*-BC_2N film for 2D light emitting diodes was demonstrated. Though films might have impurities such as small *h*-BN fragments and *h*-$B_xC_yN_z$ other than *h*-BC_2N phase, we believe that this work provide a starting point of controlling the ternary BCN compounds that retain sp^2 hybridized chemical bonds.

References

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Figures

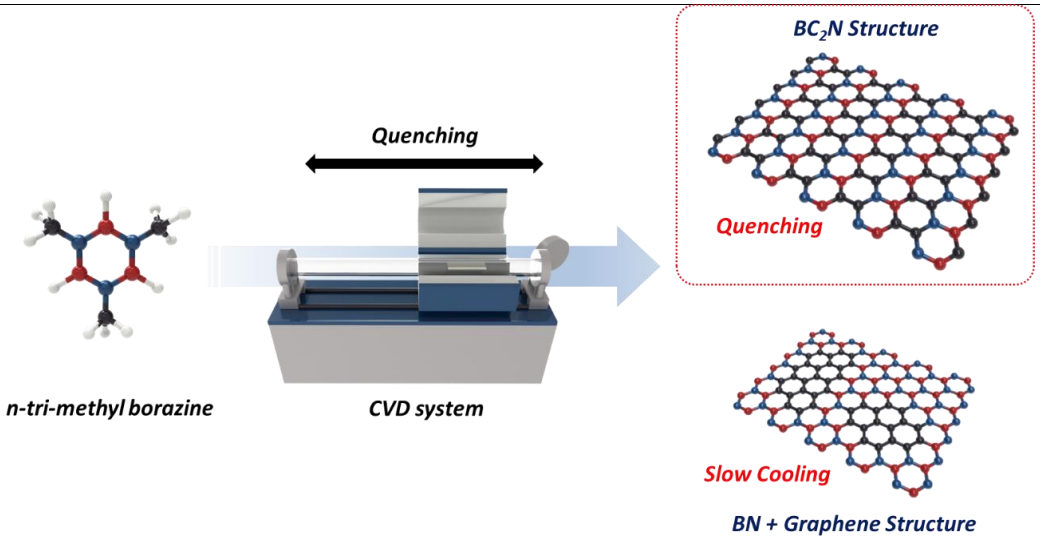

Figure 1: Schematic diagram of *h*-BC_2N synthesis.