

## **Chemical and Mechanical Engineering of two-dimensional materials**

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Research interest into two dimensional (2D) materials other than graphene has recently become intense, first because of the basic desire of researchers to explore new worlds in two dimensions from the point of view of materials research, and second to avoid the drawbacks of graphene for certain applications. Compared to metallic property of graphene, hexagonal boron nitride (h-BN) and transition metal dichalcogenides (TMDs) have insulating and semiconducting properties, respectively. Therefore, these 2D materials can be widely used for various applications regarding to their unique properties.

Herein, I present the recent research results working on graphene, h-BN and TMDs, as well as their heterostructures. The presentation includes the improved synthetic methods of 2D materials and in-plane heterostructures formed by covalent bonding of two different 2D materials, and their electrical and optical applications. In addition, the properties in 2D materials can be modulated by chemical and mechanical engineering. Our recent results attempting surface functionalization and structural engineering on 2D materials are introduced.