

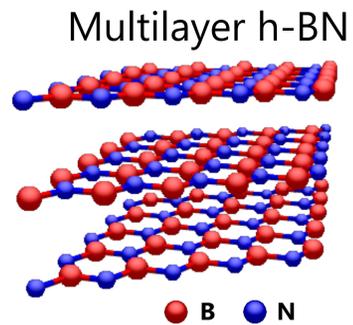
# Multilayer Hexagonal Boron Nitride (h-BN)



## New CVD Synthesis Methods for Large-area, Multilayer h-BN

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### 1. Importance of Hexagonal Boron Nitride (h-BN)

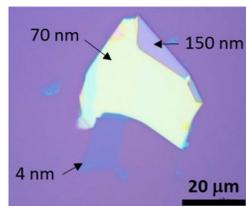


➤ Two-dimensional insulator with large band gap (5.9eV), atomically flat and dangling-bond-free surface

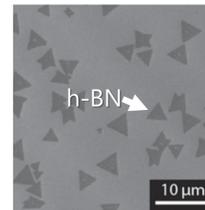
Excellent Insulating material for graphene, TMDC and other 2D materials

TMDC: Transition Metal DiChalcogenide

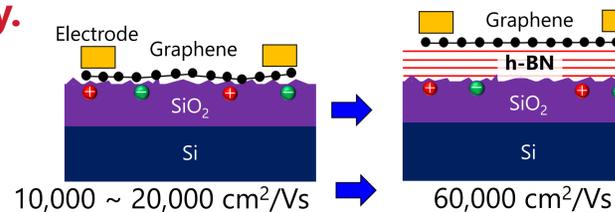
✕ Mechanical Exfoliation can provide only very small h-BN flakes.



✕ CVD method can usually give monolayer h-BN, which is not thick enough.

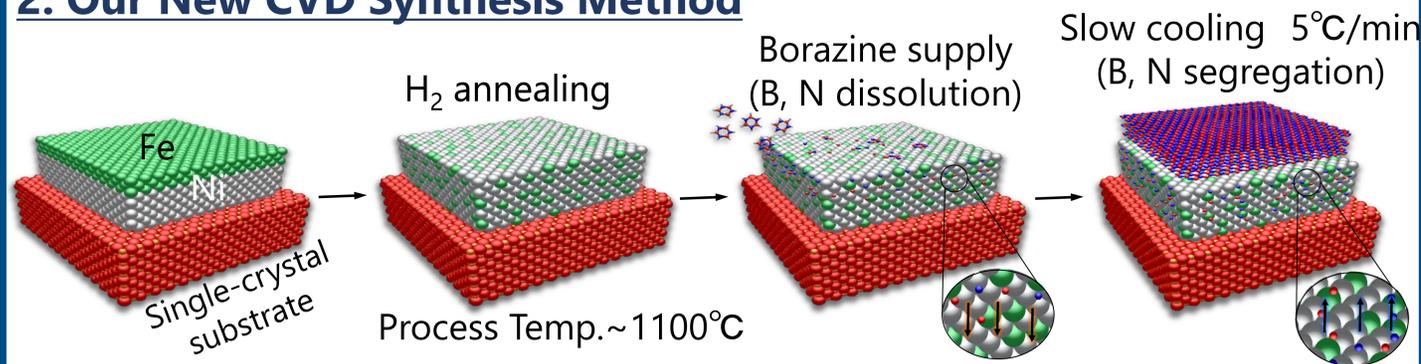


**Large-area and multilayer h-BN can reduce surface roughness, optical phonon and charge impurities of SiO<sub>2</sub> surface, and can increase the carrier mobility.**

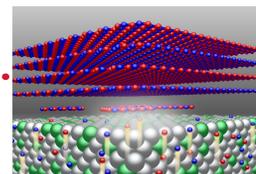


C. R. Dean *et al.*, *Nat. Nanotech.*, **5**, 722 (2010)

### 2. Our New CVD Synthesis Method

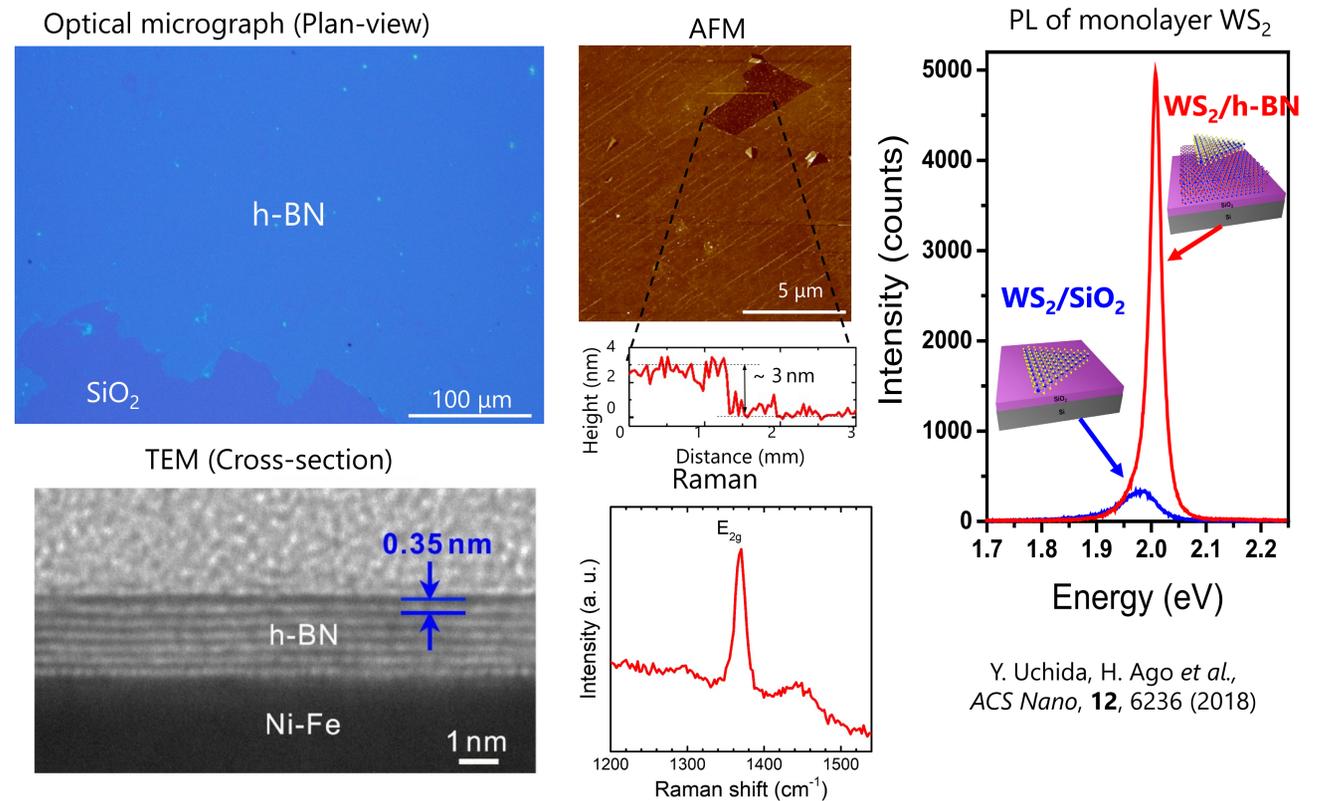


- Large area & uniform multilayer h-BN can be obtained.
- Typical thickness of the h-BN ranges from 3 nm to 10 nm.
- The h-BN can be easily transferred onto any substrates by wet process.



### 3. h-BN Quality of This Method and Prospective Applications

The below experimental data shows the quality of the h-BN



Y. Uchida, H. Ago *et al.*, *ACS Nano*, **12**, 6236 (2018)

#### Prospective Applications;

- Ideal insulator layer of hetero-structured 2D device
- Tunneling barrier for spin memory device
- Light emitting layer of deep ultraviolet device
- Oxidation-resistant coating for black phosphorus thin layer device
- Highly selective proton permeation for polymer electrolyte membrane

### 4. Patent Licensing Available

Patent No.: WO2018/128193 (JP, US, EP, KR, CN,)

JST/ IP Management and Licensing Group

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