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MDPI

Supporting Information

In-Situ Catalytic Preparation of Two-Dimensional BCN/Graphene Composite for Anti-Corrosion Application

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S1. SEM image of graphene grown on Cu foil.

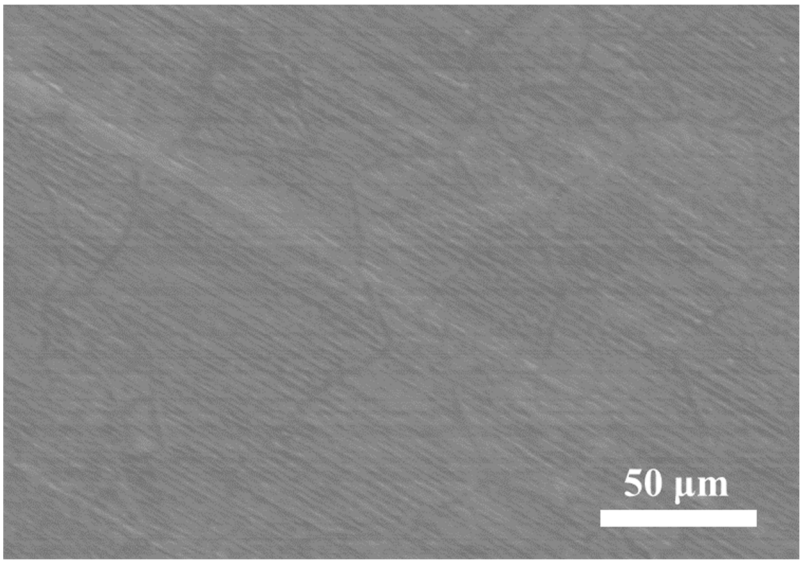

Figure S1. SEM image of graphene grown on Cu foil.

S2. EDS result of BCN/Gr 2D composite film.

EDS result of BCN/Gr 2D composite film is shown in Figure S2. As can be seen, Elements C and N are evenly distributed on the sample surface. As B atoms cannot be detected by EDS, there is no distribution of B.

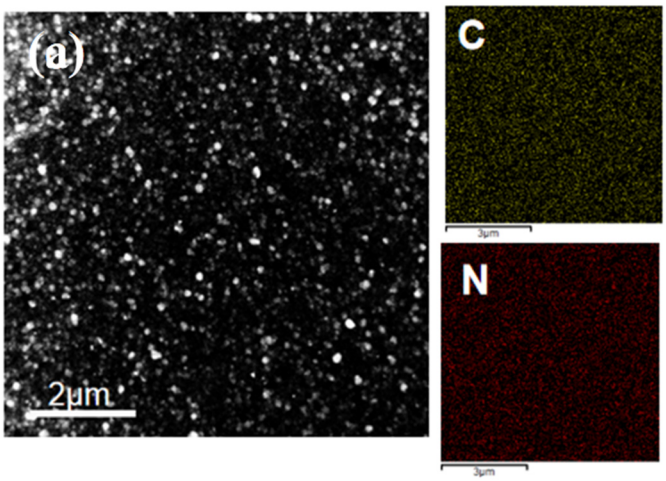

Figure S2. EDS of BCN/Gr 2D composite film (**a**).

S3. TEM and AFM results of in-situ grown BCN and BCN/Gr 2D films.

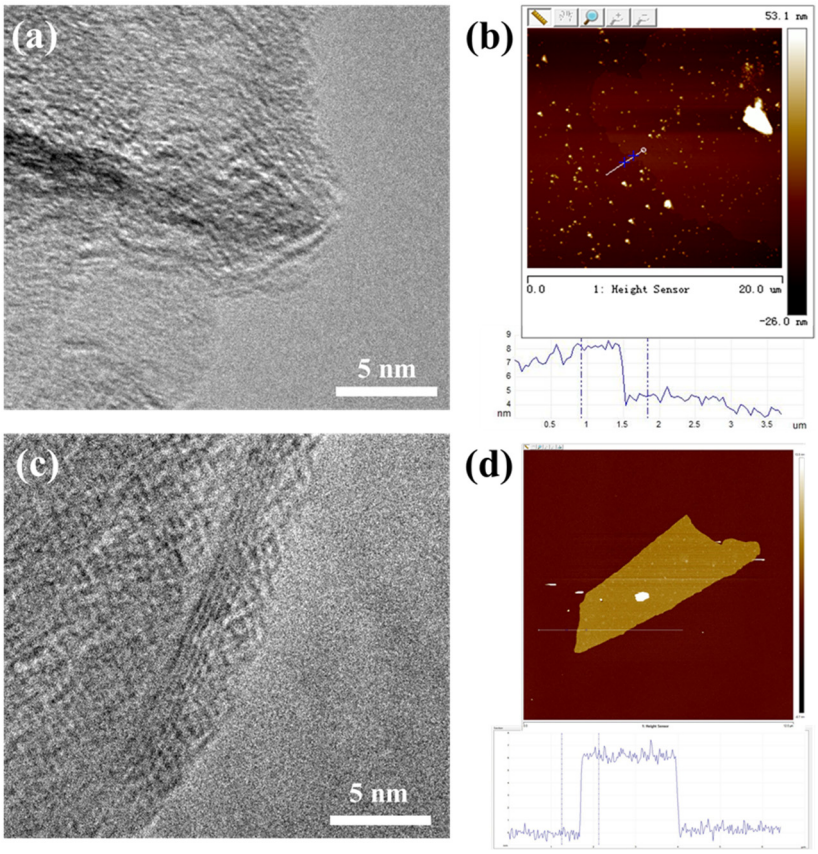

Figure S3. (**a**) TEM and (**b**) AFM of in-situ grown BCN film; (**c**) TEM and (**d**) AFM of BCN/Gr 2D composite film.

S4. Procedure of liquid etching method and preparation of BCN-BCN and BCN-Gr samples.

The diagram of liquid etching method and preparation of BCN-BCN and BCN-Gr samples are shown in Figure S4.

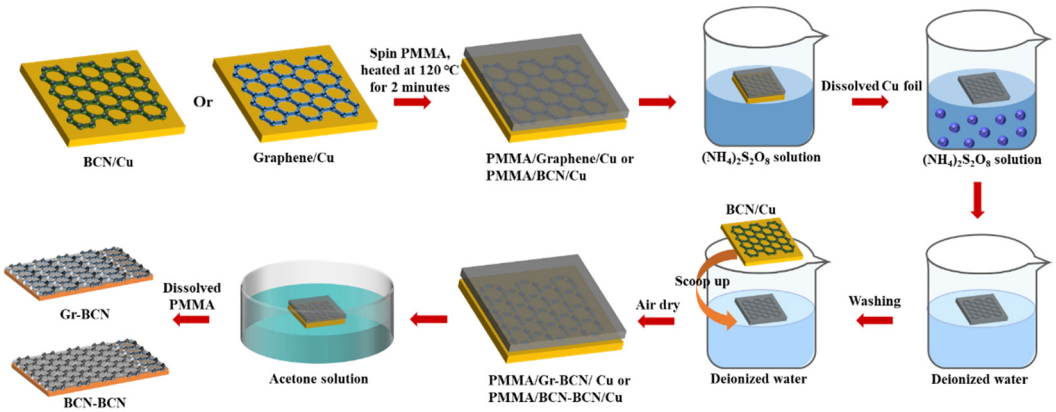

Figure S4. Diagram of liquid etching method and preparation of BCN-BCN and BCN-Gr samples.

Graphene film (or BCN film) was transferred using a standard poly (methylmethacrylate) (PMMA) assisted wet transfer method. Typically, a layer of PMMA was firstly

spin-coated on top of the graphene coated Cu substrate (or BCN coated Cu substrate) at 3000 rpm for 1 min. And then the PMMA/graphene/Cu composite (or PMMA/BCN/Cu composite) was put on the surface of 0.8 mol/L $(NH_4)_2S_2O_8$ solution, and the Cu substrate could be etched away. As a result, PMMA coated graphene (or PMMA coated BCN) was floated on the surface of etchant. Then, PMMA protected graphene film (PMMA protected BCN film) was fished out by BCN/Cu substrate and rinsed in D.I. water for twice. Finally, the sample was submerged in acetone for 30 min to remove the PMMA, and leaving the graphene layer (or BCN layer) individually coated on BCN/Cu substrate, thus the BCN-BCN and BCN-Gr samples are prepared.

S5. Preparation of CVD grown graphene layer

High quality graphene layers were grown on Cu substrate by home-built CVD system which consists of a quartz tube furnace connected to a mechanical pump and gas manifolds. In a typical procedure, Cu foils (cut into 3.5 cm × 3.5 cm) were loaded into the center of the heating zone on a quartz plate. After the initial evacuation of the tube, nitrogen was used as protection gas throughout the growth process. During growth, the furnace was firstly heated to the growth temperature (950 °C) for 30 min. A mixed gas flow containing CH_4 and H_2 was introduced for the graphene growth and the growth time is 25 min.

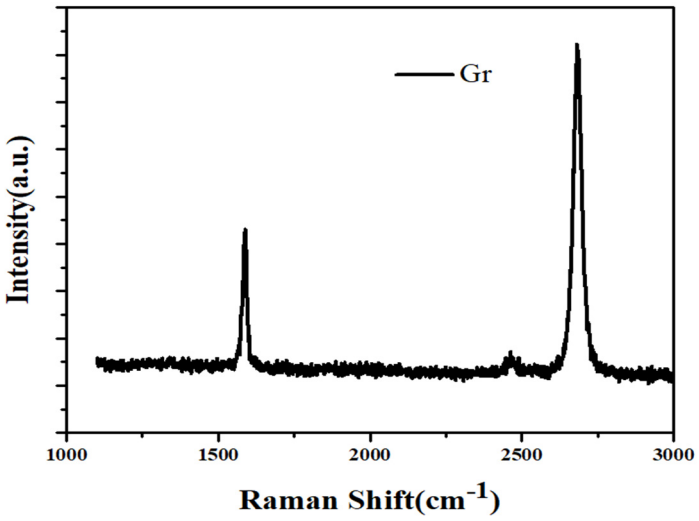

Figure S5. Raman spectrum of CVD grown graphene.