Supporting Information for

Three-Dimensional Boron- and Nitrogen-Codoped Graphene Aerogel Supported Pt Nanoparticles as Highly Active Electrocatalysts for Methanol Oxidation Reaction

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Total number of pages: 6

Total number of Figures: 9

Supplementary Results

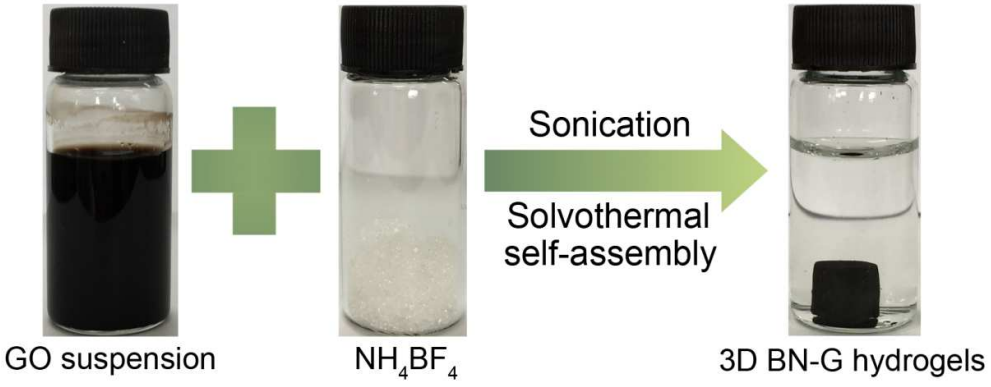

Figure S1. The synthetic process for 3D BN-G aerogels, which includes: (1) mixture of GO suspension and NH_4BF_4 by magnetic stirring and sonication; (2) generation of 3D BN-G hydrogels by a solvothermal process; (3) formation of 3D BN-G aerogels by freeze-drying.

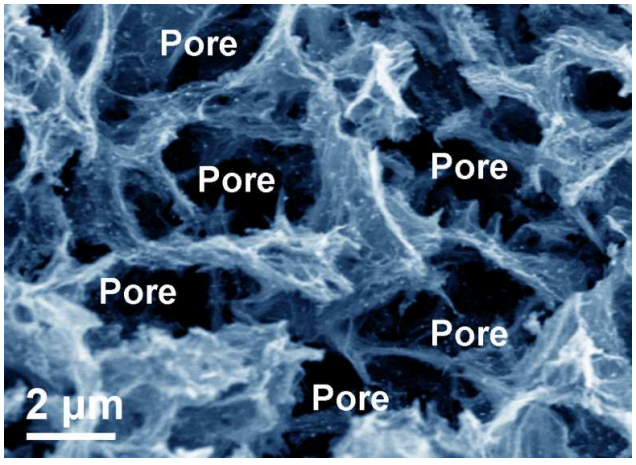

Figure S2. FE-SEM images of the 3D Pt/BN-GA catalyst, indicating that the material has numerous well-defined macropores.

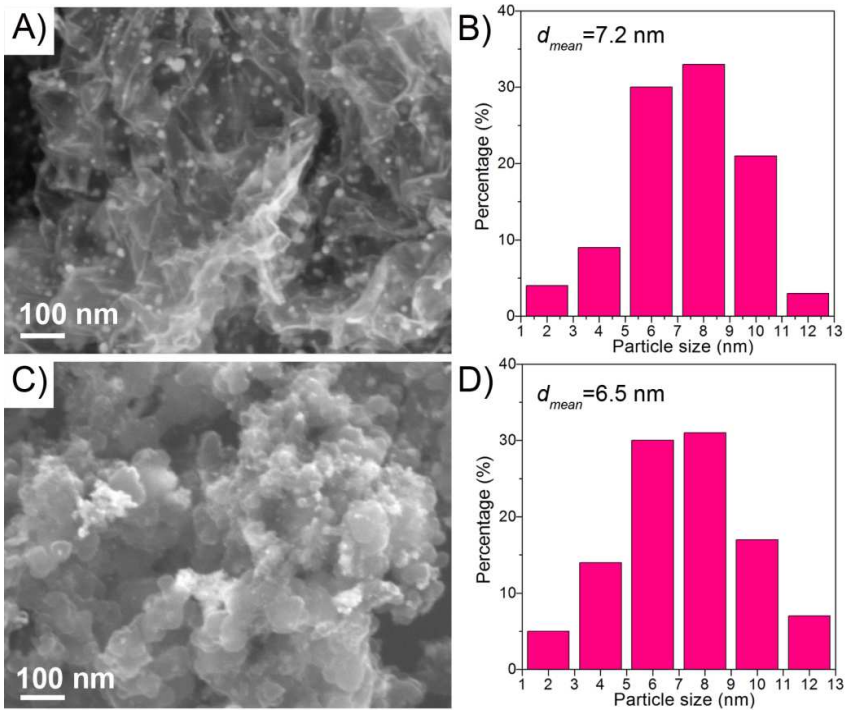

Figure S3. Typical FE-SEM images and Pt particle size distribution of (A and B) Pt/G and (C and D) Pt/C, respectively, showing that the Pt particles easily form large clusters in these conventional samples.

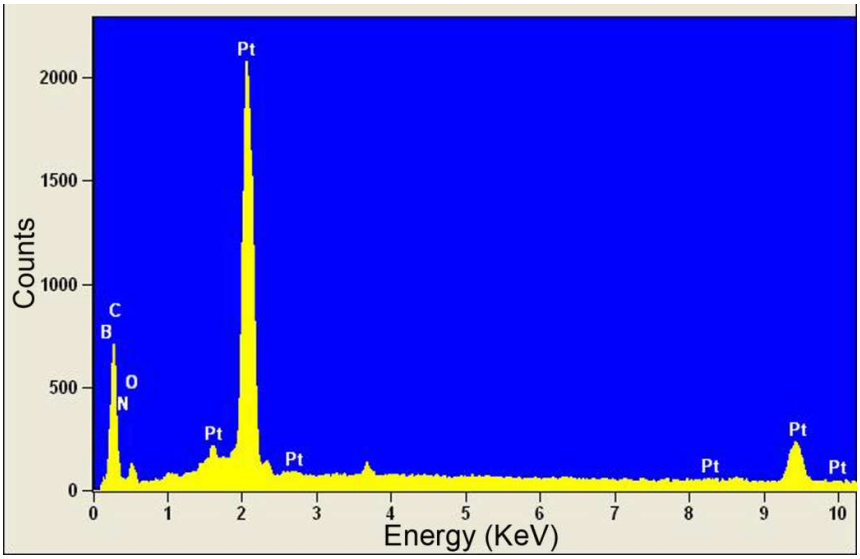

Figure S4. EDX spectrum of the 3D Pt/BN-GA catalyst confirms the existence of C, O, B, N, and Pt components in the material.

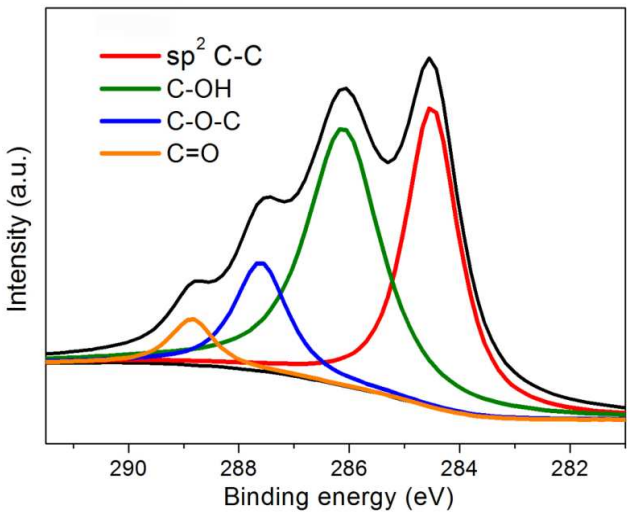

Figure S5. High-resolution C 1s XPS spectrum of GO, showing that the carbon sheets possess a large amount of oxygen functional groups.

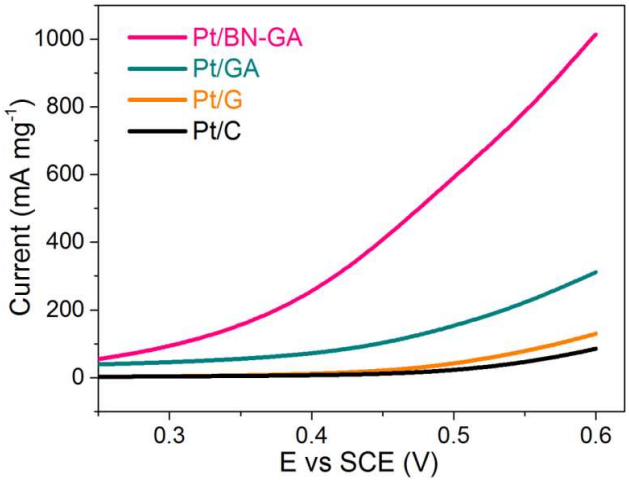

Figure S6. Linear sweep voltammetrys of Pt/BN-GA, Pt/GA, Pt/G, and Pt/C catalysts in 1 M H_2SO_4 with 2 M methanol solution at 20 mV s^{-1}, implying that the catalytic reactions are easier to take place on the Pt/BN-GA electrode.

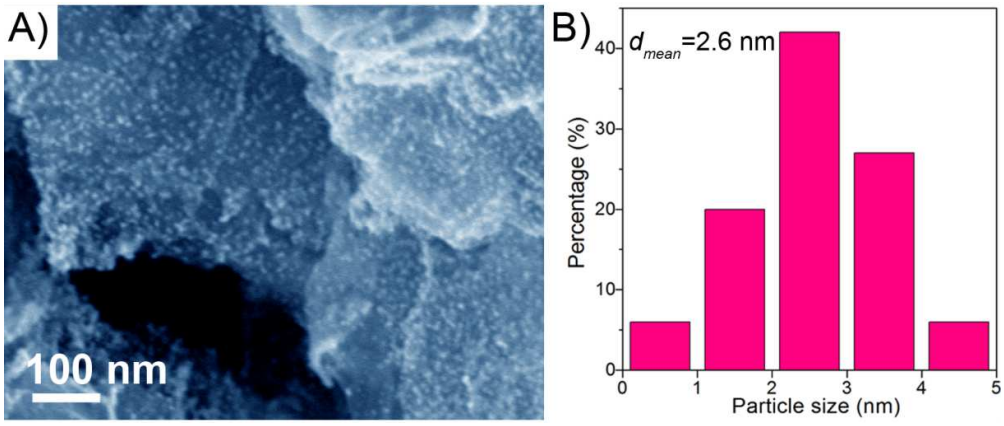

Figure S7. Representative (A) FE-SEM image and (B) Pt particle size distribution of the Pt/BN-GA catalyst after the chronoamperometric test, proving its good structural stability under the electrocatalytic conditions.

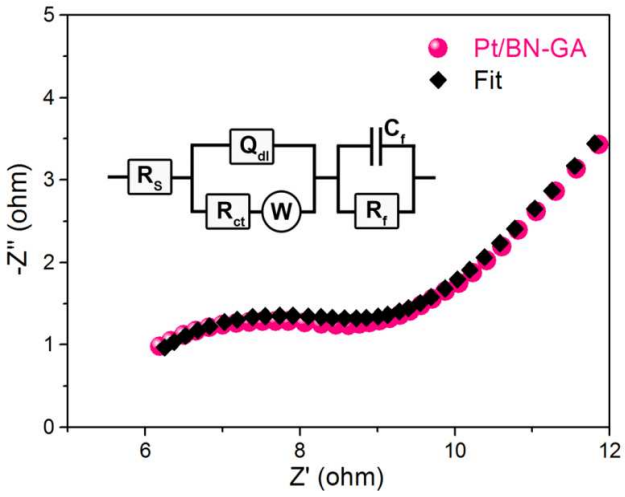

Figure S8. AC impedance spectrum of the Pt/BN-GA electrode and the corresponding fitting curve, proving a good match between the testing and fitting results. The inset is the equivalent circuit: R_s and R_{ct} represent the resistances for electrolyte and catalyst, respectively, Q_{dl} is a constant phase element, W represents semiinfinite diffusion at the interface between electrolyte and electrode, R_f and C_f are the resistance and capacitance for the Nafion-carbon film, respectively.

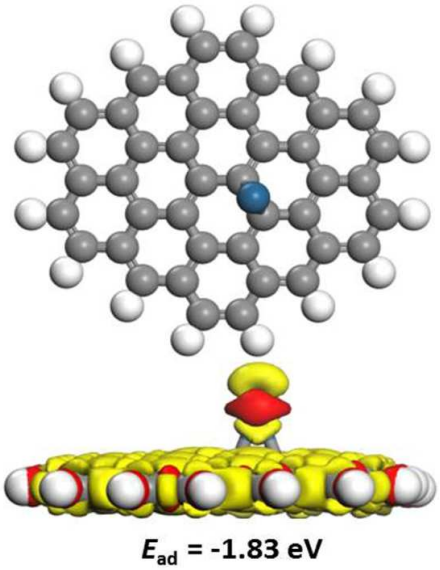

Figure S9. The relaxed atomic structures of a Pt atom adsorbed on an intrinsic graphene.