Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

Electronic Supporting Information

Self-assembled phosphomolybdic acid-polyaniline-graphene composite as an efficient catalyst towards methanol oxidation

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1. The effect of PANI content in PANI-HPMo-GS on catalytic activity for methanol oxidation

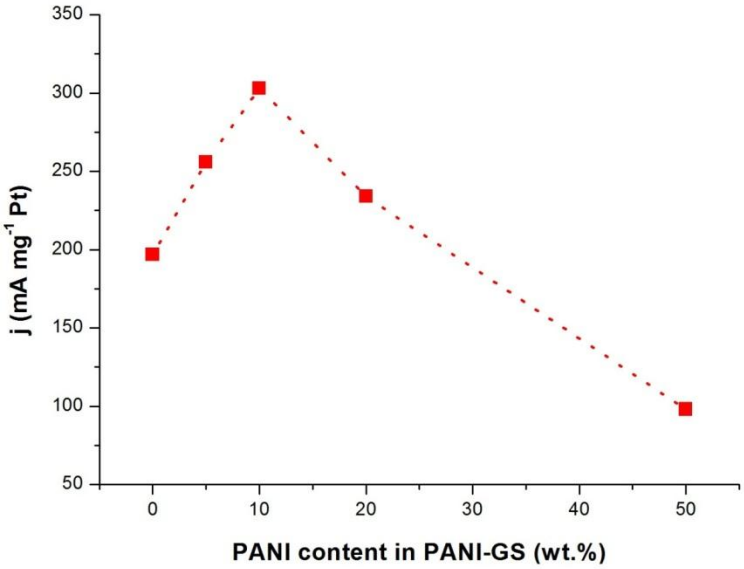

Fig.S1. Forward peak current densities for methanol oxidation as a function of PANI content in PANI-HPMo-GS.

The presence of PANI on PANI-HPMo-GS can facilitate the dispersion of Pt particles, but decreases the electric conductivity of PANI-HPMo-GS because GS has much higher conductivity than PANI. Therefore, there will be an optimal PANI content in PANI-HPMo-GS. In this work, four contents (5%, 10%, 20% and 50% PANI) were investigated and the Pt/PANI-HPMo-GS with 10% PANI just showed the most excellent performance. So the reason is the balance of the dispersion of Pt nanoparticles and the conductivity of PANI-HPMo-GS support.

The dispersion of GS, HPMo-PANI and PANI-GS in distilled water

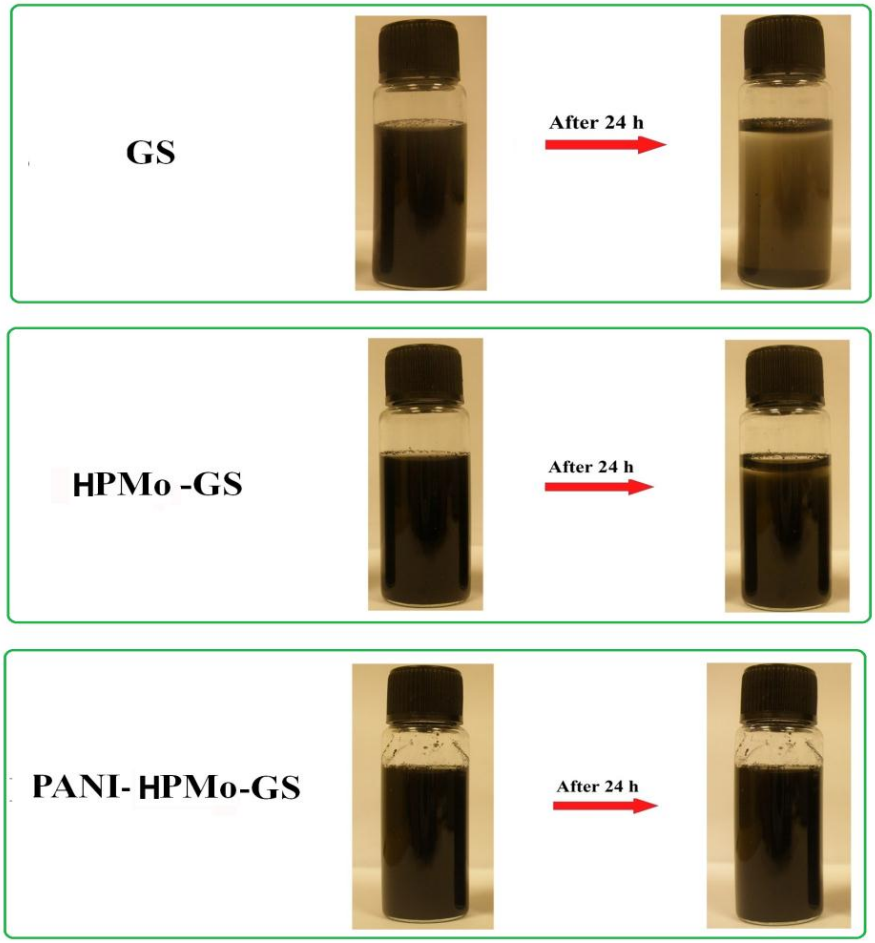

Fig.S2. The dispersion of GS, HPMo-GS and PANI- HPMo-GS in distilled water

2.5 mg of GS, HPMo-GS and PANI-HPMo-GS were added in 5 ml distilled water, respectively. After ultrasonic treatment, these three solutions were placed for 24h. It can be observed that the HPMo-GS and PANI-HPMo-GS solution were still a homogeneous dispersion. In the case of GS solution, GS precipitated at the bottom of the bottle.

2. The histograms of Pt particle diameters

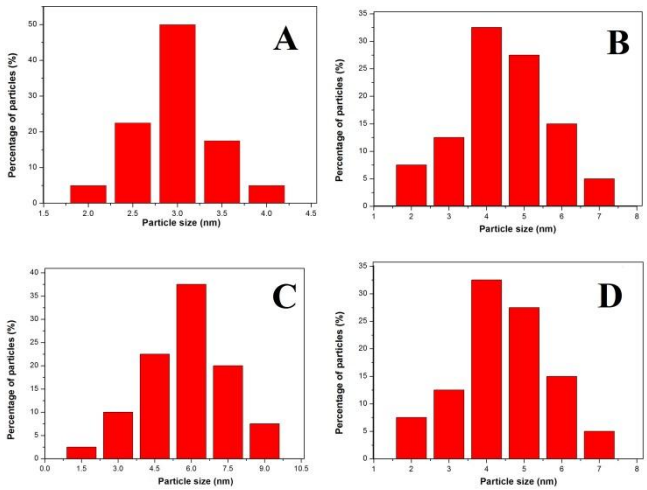

Fig.S3. The histograms of the Pt particle diameters for Pt/PANI-HPMo-GS (A), Pt/PANI-GS (B), Pt/GS (C) and commercial Pt/C (D)

3. TEM images of the PANI-HPMo-GS and Pt/PANI-HPMo-GS

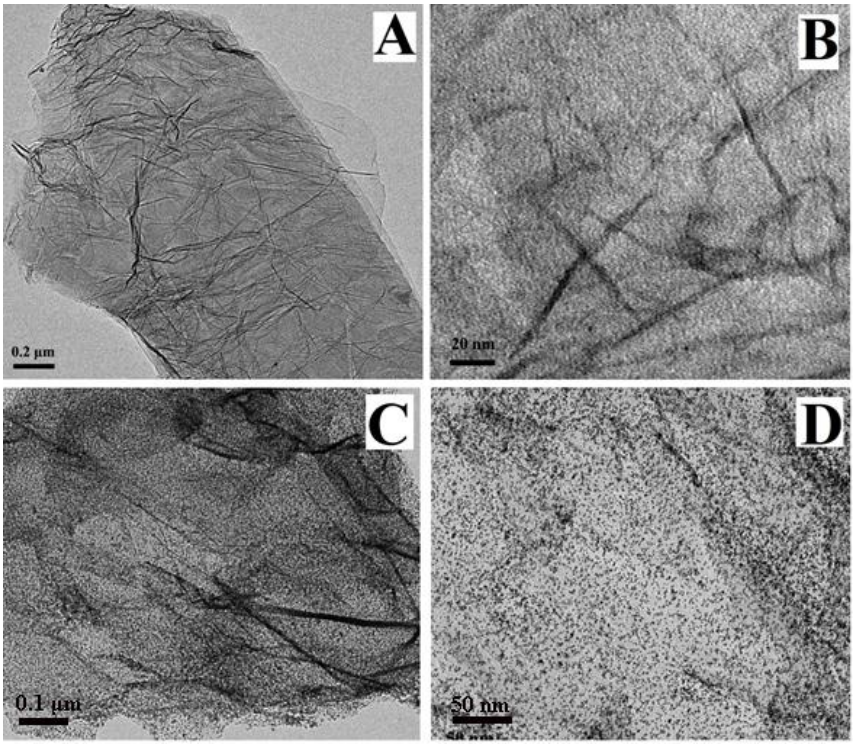

Fig.S4. TEM images of PANI-HPMo-GS (A and B) and Pt/PANI-HPMo-GS (C and D) at different magnifications

4. SEM of images of PANI-HPMo-GS and Pt/PANI-HPMo-GS

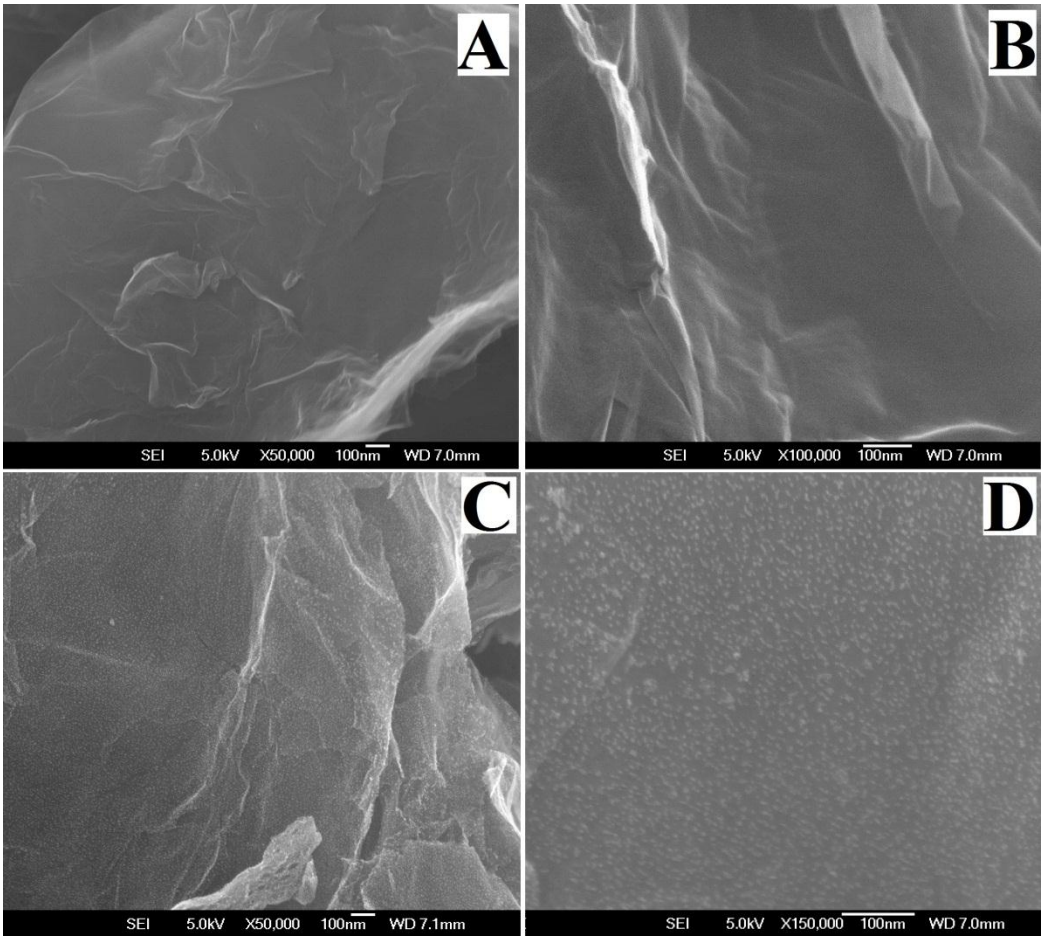

Fig.S5. SEM images of PANI-HPMo-GS (A and B) and Pt/PANI-HPMo-GS (C and D) at different magnifications.

5. EDX test

Table S1. The weight percent of elements for catalyst samples by EDX

Samples	C (%)	Mo (%)	Pt (%)
Pt/PANI-HPMo-GS	67.14	2.42	30.44
PANI-GS	70.77	0	29.23
Pt/GS	70.32	0	29.68
Pt/C(JM)	69.46	0	30. 54
Pt/PANI-HPMo-CNTs	66.90	2.58	30.52
Pt/ PANI-HPMo-C	67.69	2.15	30.16

6. Cyclic voltammograms of Pt/PANI-HPMo-GS in electrolytes of 0.5 M H_2SO_4.

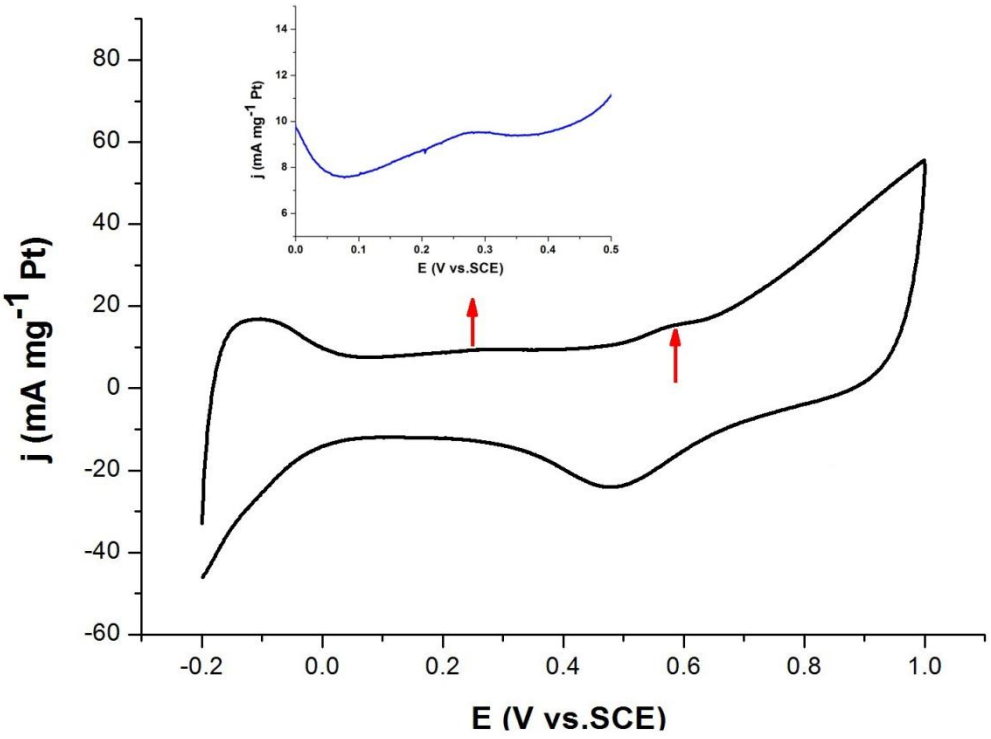

Fig.S6. Cyclic voltammograms of the Pt/PANI-HPMo-GS catalyst measured in 0.5 M H_2SO_4

The inset is the partial magnification in the range 0 V-0.5 V. Two characteristic peaks at 0.27 V (vs. SCE) and 0.58 V (vs. SCE) corresponding to PANI can be detected, which confirms that PANI has been successfully formed on HPMo-GS

7. cycling stability

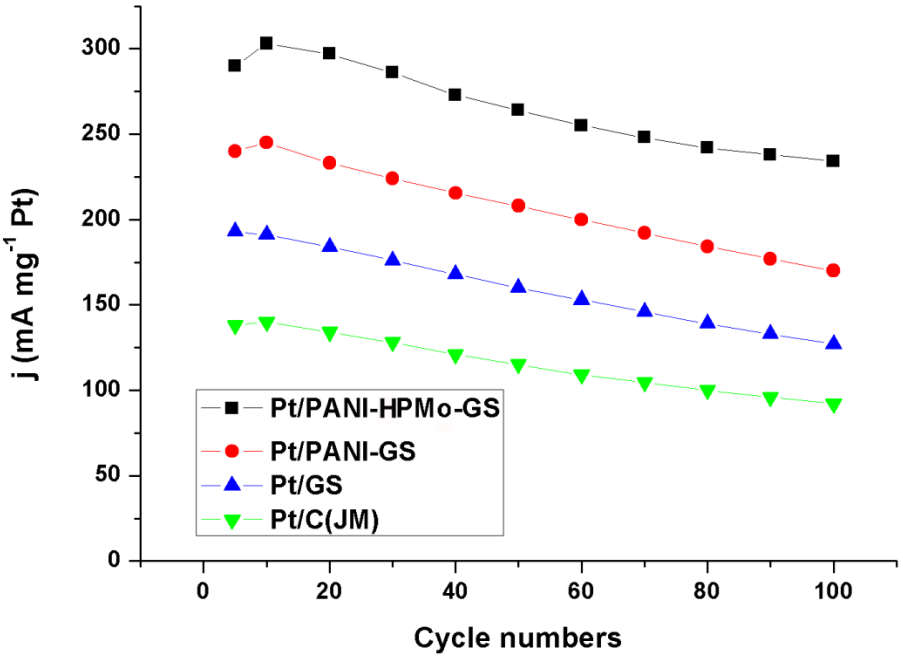

Fig.S7. The forward peak current densities for methanol oxidation as a function of scanning cycles measured in 1 M CH_3OH + 0.5 M H_2SO_4.