

# Simultaneous reduction, exfoliation and functionalization of graphite oxide into graphene-platinum nanoparticles hybrid toward methanol oxidation.

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## Supporting Information

### XRD pattern of graphite and graphite oxide

The XRD pattern of graphite oxide, shows increase in interspacing from 0.34 nm to 1.01 nm with significant decrease and broadening of graphitic (002) peak intensity.

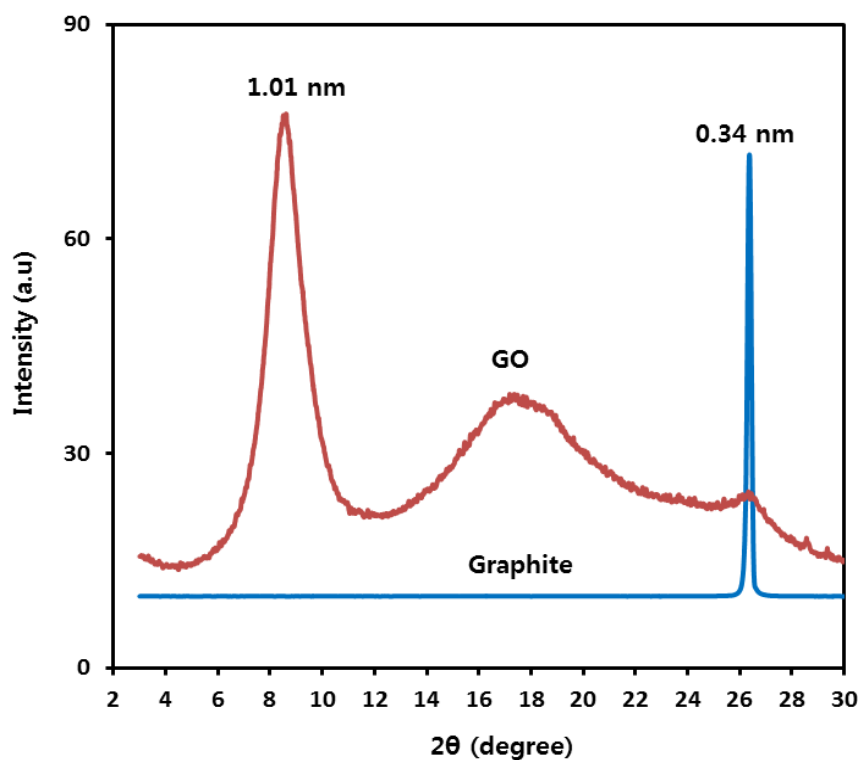
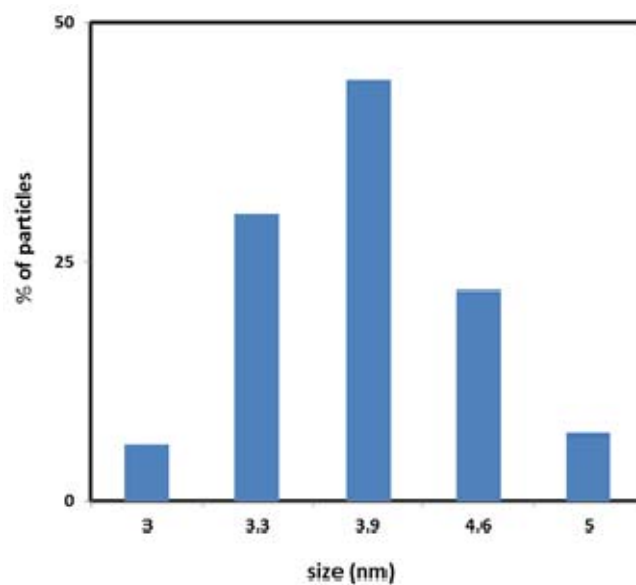
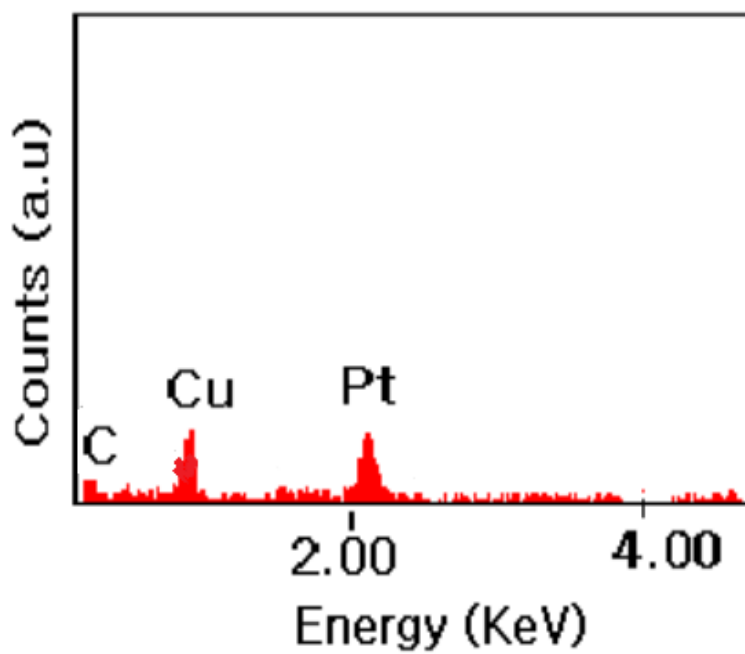


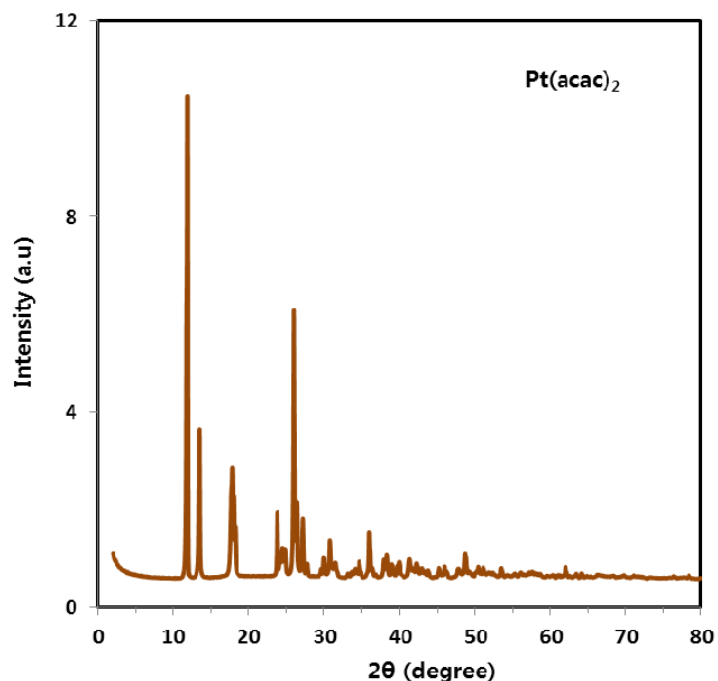
Fig. S1 XRD pattern of graphite and graphite oxide (GO)



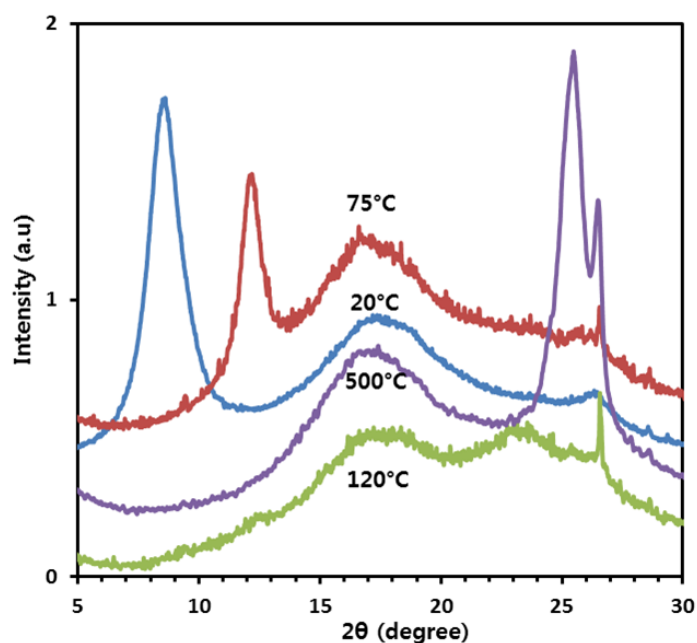
**Fig. S2** Platinum particle size distribution curve



**Fig. S3** EDX spectrum of Pt-G



**Fig. S4 XRD pattern of pure Pt(acac)<sub>2</sub>**



**Fig. S5 XRD pattern of GO sample heated at various temperature conditions under N<sub>2</sub> atmosphere without Pt(acac)<sub>2</sub> precursor.**

The XRD patterns of GO samples (without Pt(acac)<sub>2</sub>) heated at various temperature indicates shift in GO peak position from 10.1° to 26.1°, which means the GO layer interspacing decreases from 1.01 to 0.4 nm respectively. This may be due to progressive removal of surface oxy-functional groups and restacking of reduced GO sheets.

### TGA and DTGA weight loss curve of GO and Pt(acac)<sub>2</sub>

DTG and TGA results indicate initial decomposition temperature ( $T_{\text{onset}}$ ), temperature of maximum weight-loss ( $T_{\text{max}}$ ) and final degradation temperature ( $T_{\text{final}}$ ) of Pt(acac)<sub>2</sub>, and GO. The  $T_{\text{onset}}$  and  $T_{\text{final}}$  for Pt(acac)<sub>2</sub> is at around 160°C and 240° and has a major weight loss peak ( $T_{\text{max}}$ ) at 226°C, which can be assigned to the decomposition of acetylacetonate groups. But for GO, the  $T_{\text{onset}}$  and  $T_{\text{final}}$  is at around 160°C and 460° and has a minor (at 49.8°C) and major (at 233°C) weight loss peaks that can be assigned to removal of moisture and oxy-functional groups. Hence heating at temperature above 450°C is necessary for complete removal of surface oxy-functional groups available on GO.

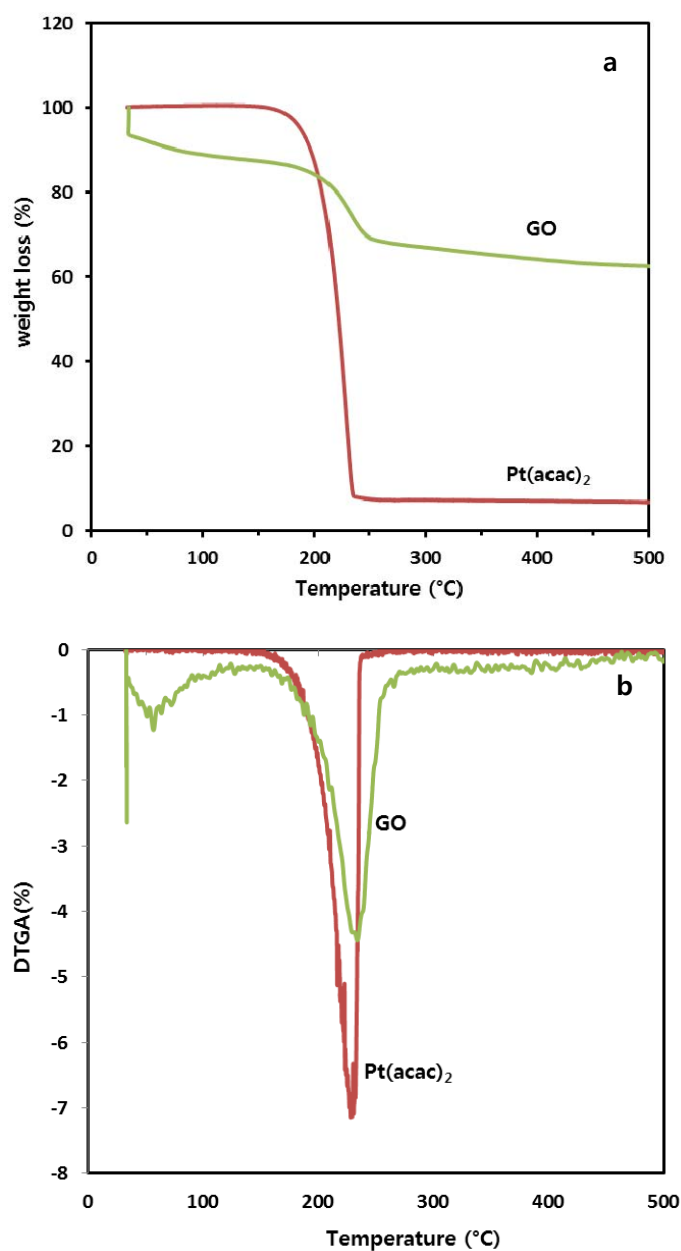


Fig. S6 (a) TGA and (b) DTGA weight loss curve of GO and Pt(acac)<sub>2</sub>

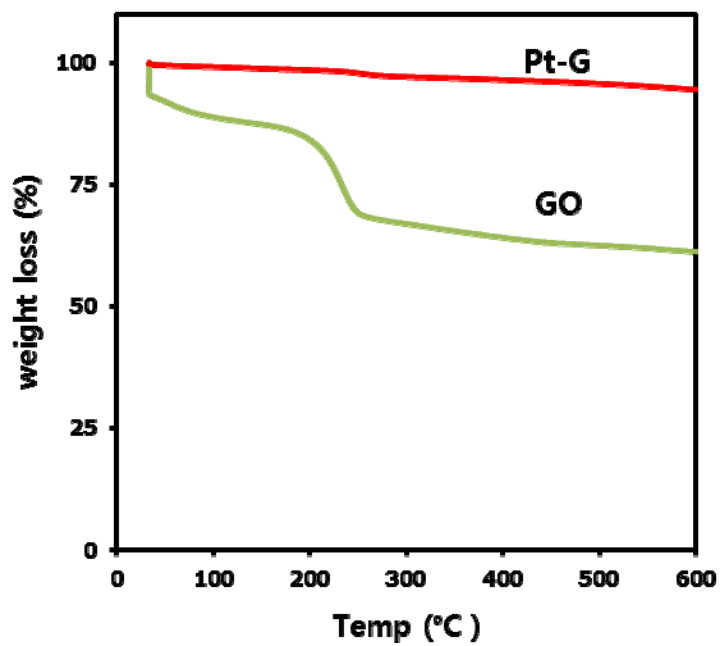


Fig. S7 TGA curves of GO and Pt-G

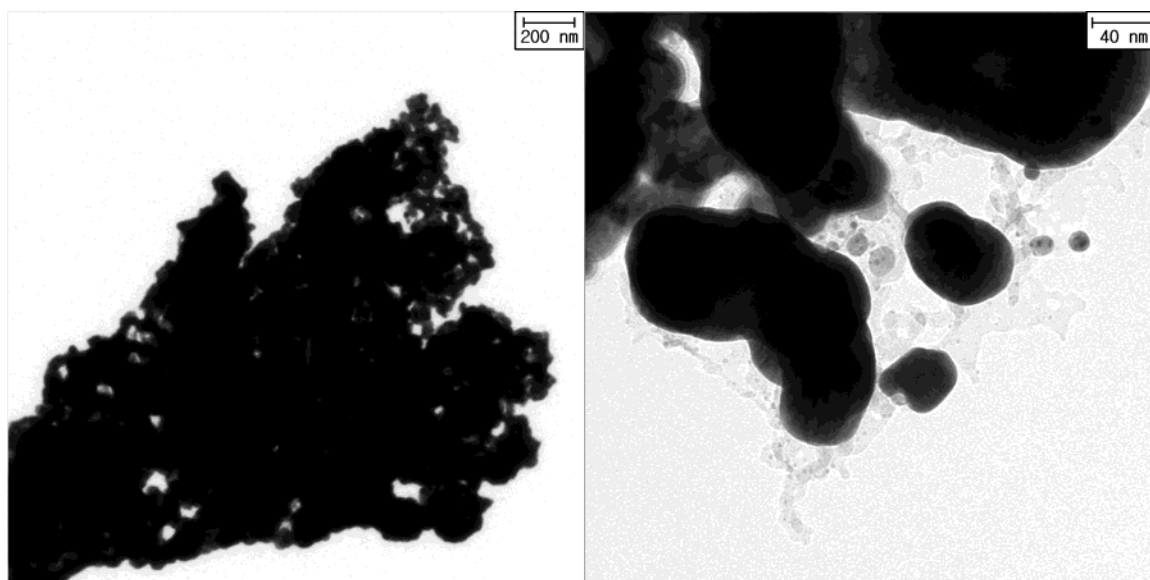


Fig. S8 TEM image of Pt(acac)<sub>2</sub>-graphite sample heated at 500 °C under N<sub>2</sub> atmosphere