

Electronic Supplementary Information

Selective hydrogenation of cinnamaldehyde over Pt nanoparticles deposited on reduced graphene oxide

Zhuohua Sun, Zeming Rong*, Yong Wang, Yan Xia, Wenqiang Du, Yue Wang

State Key Laboratory of Fine Chemicals, School of Chemical Engineering,
Dalian University of Technology, Dalian 116024, P. R. China.
Tel: 86 411 84986242;
E-mail: zeming@dlut.edu.cn

Experimental section

Preparation of Pt catalyst

The GO material for this study was prepared with natural graphite powder according to the reported reference[14]. 400 mg of as-prepared dried GO sample and 13mg of H_2PtCl_6 were mixed in a solution containing 21 mL of deionized water and 80 mL of ethylene glycol (EG) under continuous stirring at room temperature for 2h. The above mixture was treated in an ultrasonic bath (140 W) for 2 h to ensure that most GO was fully exfoliated and then heated to 393K in a stainless steel autoclave with Teflon inner layer. After being kept at 393K for 24 h, the mixture was cooled to room temperature and filtered. The residue was washed with deionized water and ethanol. Finally, the resulting product was dried in a vacuum desiccator at 313K for 12h and was denoted as Pt/RGO.

Pt nanoparticles deposited on multi-walled carbon nanotubes and activated carbon were prepared by the same procedures and were denoted as Pt/CNTs and Pt/AC, respectively.

Characterization

Raman spectra of samples were collected from 200 to 2000 cm^{-1} on a Thermo Scientific DXR Raman microscope using a 532nm laser source. The GO sample was also examined by atomic force microscopy (AFM, VEECO Digital Instruments NanoMan). X-ray diffraction (XRD) spectra of the catalysts were carried out on a RIGAKU D/MAX 2400 diffractometer at 40 kV and 100 mA with $\text{Cu K}\alpha_1$ radiation ($k = 1.5406\text{\AA}$) in the range from 5° to 80° . Transmission electron microscopy (TEM) images were obtained using an accelerating voltage of 100 kV (TEM, Hitachi H7700). X-ray photoelectron spectra (XPS) were recorded on ESCALAB 250 Xi. The amounts of Pt content were ascertained using an inductively coupled plasma-optical emission spectrometer, (ICP, Perkin Elmer, Optima 2000DV). The BET surface area was obtained by using a 3H-2000PS1 sorption system (Beishide Instrument-ST (Beijing) Co., Ltd.). Before the test, the catalyst was dried in vacuum condition at 423K for 2 h. The Nitrogen isotherms were carried out at 77 K. The specific surface areas were calculated using the BET method.

Hydrogenation of cinnamaldehyde

The hydrogenation reaction was carried out in a 75 mL stainless autoclave. In a typical procedure, the catalyst was dispersed in 10 mL isopropanol and then 0.5g cinnamaldehyde was added into solution. The reactor was sealed, purging with N_2 and H_2 for 3 times respectively and then pressurized to 2.0 MPa when the temperature reached 313K. The stirring rate was controlled with 400rpm. The reaction process was monitored by gas chromatography (GC) (Agilent 6890) with a flame ionization detector (FID) system.

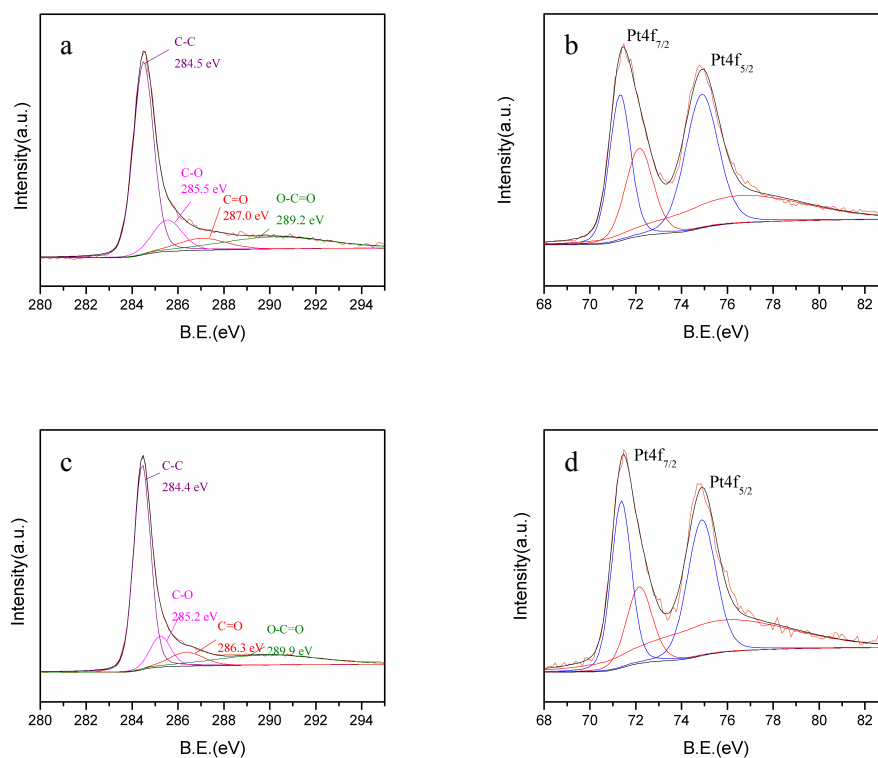


Fig.S1 XPS spectra of C_{1s} region for Pt/C(a), Pt/CNTs(c) and Pt_{4f} region for Pt/C(b), Pt/CNTs(d).

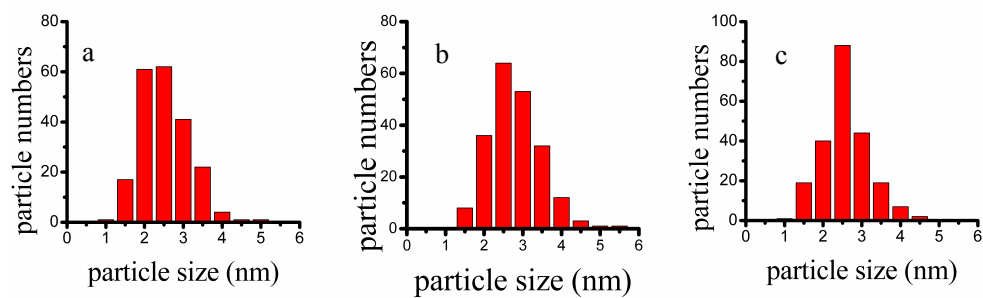


Fig.S2 Particle size of Pt/C(a), Pt/CNTs(b) and Pt/RGO(c) calculated from TEM.