Supporting Information for **"Comparative study of layer by layer assembled multilayer films based on graphene oxide and reduced graphene oxide on flexible polyurethane foam: flame retardant and smoke suppression properties"**

Haifeng Pan[*,a], Bihao Yu [a], Wei Wang [b], Ying Pan[b] , Lei Song[b] , Yuan Hu[*,b,c]

[a]Faculty of Engineering, China University of Geosciences, Wuhan430074, People's Republic of China.

[b]State Key Laboratory of Fire Science, University of Science and Technology of China, 96 JinzhaiRoad, Hefei, Anhui 230026, People's Republic of China.

[c]Suzhou Key Laboratory of Urban Public Safety, Suzhou Institute of University of Science and Technology of China, 166 Ren'ai Road, Suzhou, Jiangsu 215123, People's Republic of China.

* Corresponding author. Fax/Tel: +86-551-63601664.

E-mail address: yuanhu@ustc.edu.cn (Yuan Hu); hfpan@mail.ustc.edu.cn (Haifeng Pan).

Preparation of Graphene Oxide (GO)

In a typical process, expandible graphite (2 g) and sodium nitrate (1 g) were mixed with sulfuric acid (46 ml, 98wt%) in an ice bath. Then, potassium permanganate (6.0 g) was slowly added to the mixture under stirring conditions. Afterwards, the ice bath was removed and the mixture was heated at 35 ^{O}C for 0.5 h. Next 92 ml of deionized water was carefully dropwise to the suspension. The reaction was allowed to proceed for 30 min at 100 ^{O}C; then the resultant bright-yellow suspension was diluted to 280 ml and further treated with 5 ml of 30% hydrogen peroxide. The GO product was puried by centrifugation and thorough washing with a 10% HCl solution and deionized water to reach a pH near 7. The RGO could be obtained by the thermal reduction of GO nanosheets.

GO Characterization

Transmission electron microscopy (TEM) images of GO were obtained on a Jeol JEM-100SX transmission electron microscope with an acceleration voltage of 100 kV. A drop of GO suspension was deposited on a Formvar and carbon coated copper grid, the water was naturally evaporated at ambient temperature. TEM images of GO were acquired without any sample staining. Atomic force microscopy (AFM) observation of GO was performed on a DI Multimode V scanning probe microscope (Veeco). Prior to AFM analysis, a drop of diluted GO suspension was deposited on a mica surface and allowed to dry at room temperature. The scanning was conducted in tapping mode and the height and phase images were collected. X-ray diffraction (XRD) were performed with a Rigaku D- Max-Ra rotating anode X-ray diffractometer equipped with a Cu-K a tube and a Ni filter (l ¼ 0.1542 nm). FTIR

spectra were recorded on a Nicolet MAGNA-IR 750 FTIR spectrometer. KBr ground in a mortar with a pestle and enough solid sample was ground with KBr to make a 1 wt.% mixture for making KBr pellets. The mixture was pressed into a tablet, which was then placed in a ventilated oven. The transition modewas used, and the wavelength range was set from 4000 to 500 cm^{-1}.

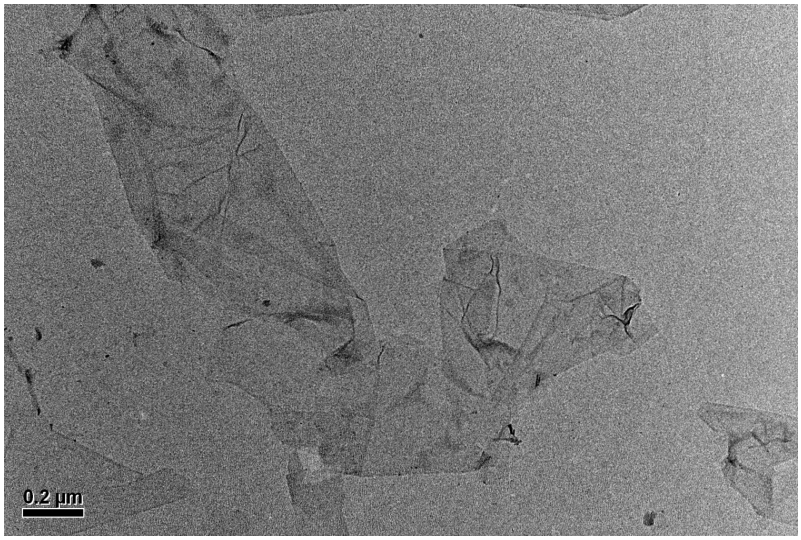


Fig.S1 TEM images of GO.

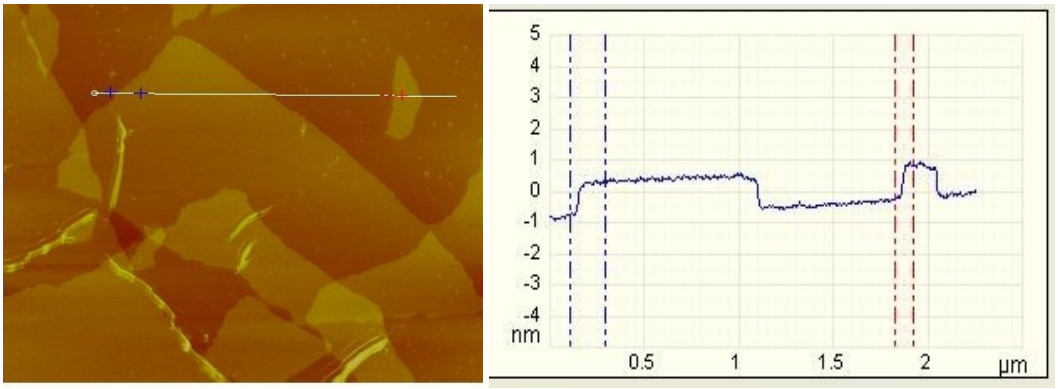


Fig. S2 AFM images of GO.

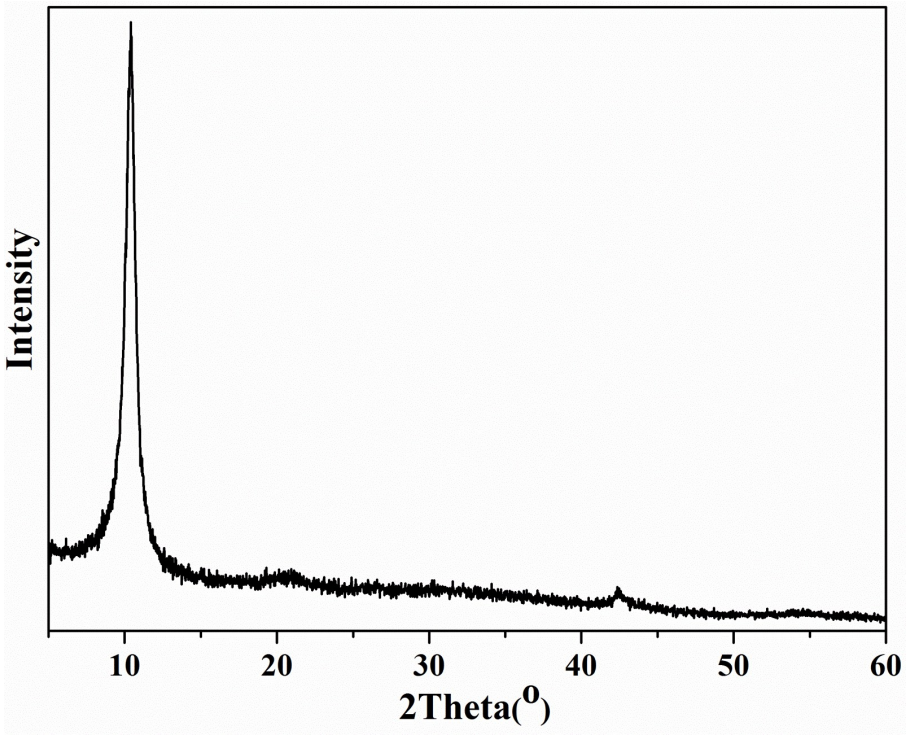
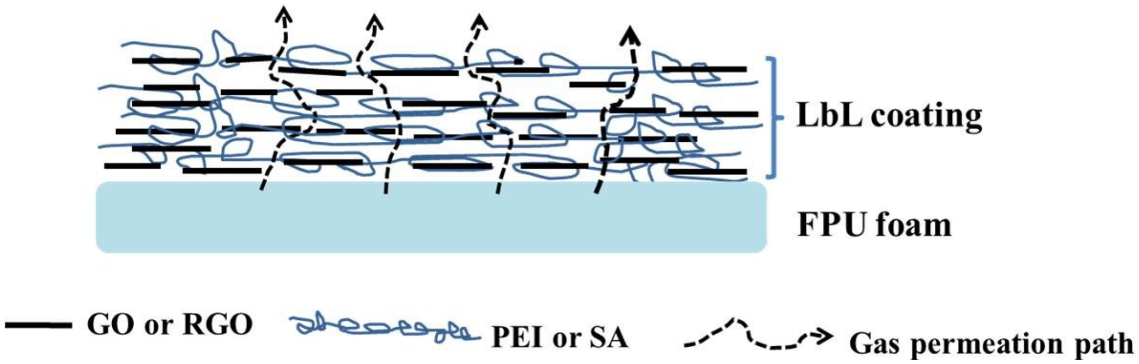
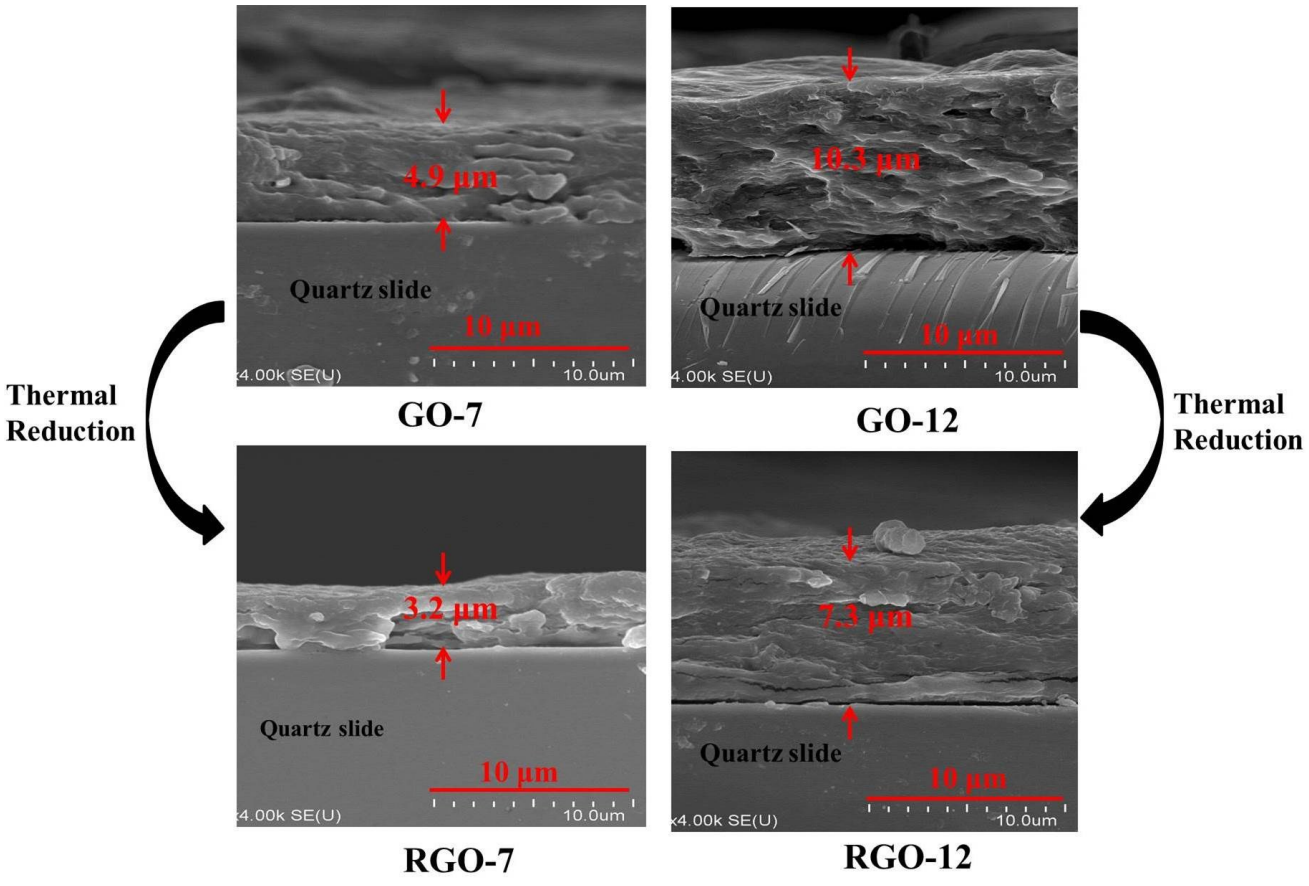


Fig. S3 XRD pattern of GO.



(a)



(b)

Fig. S4: (a) Schematic illustration of barrier effect of GO or RGO filled LbL coating; (b) SEM images of the fractured surfaces of GO coated multilayer films on quartz slide before (GO-7 and GO-12) and after (RGO-7 and RGO-12) thermal reduction.

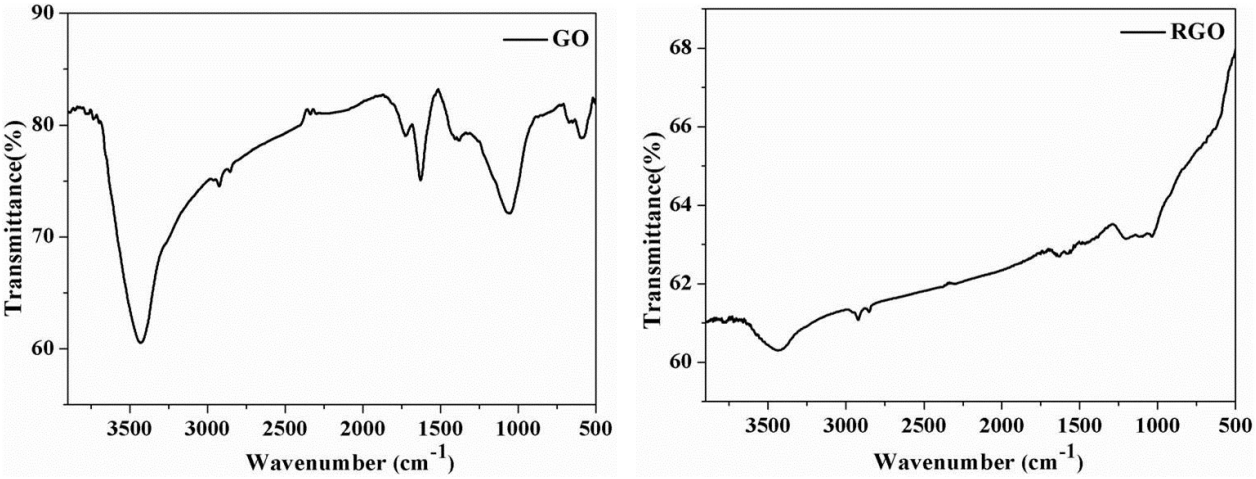


Fig. S5 FTIR spectra of GO and RGO.