

Supporting information

Photoluminescence of Graphene Oxide Infiltrated into Mesoporous Silicon

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Raman analysis

Raman spectrum of graphene oxide deposited on crystalline silicon was obtained using a Confocal Raman Microscope LABRAM Aramis (by Horiba Jobin-Yvon, France). A laser with a wavelength of 532 nm was used as excitation source. The objective used to perform the analysis was a 50x with a long working distance. The characteristic Raman spectrum of graphene oxide includes the G peak at 1580 cm^{-1} , the D peak at 1350 cm^{-1} , the 2D peak at 2700 cm^{-1} and the D+G peak at 2940 cm^{-1} . Figure S1 shows Raman spectrum of GO deposited on crystalline Si.

Amorphous silicon fabrication and optical characterization

Amorphous silicon (aSi) was fabricated starting from a quartz microscope slide. After a substrate cleaning, aSi was deposited on top by a Plasma Enhanced Chemical Vapor Deposition (PECVD) process at a pressure of 0.8 mbar, temperature of $250\text{ }^{\circ}\text{C}$, power of 2W and a SiH_4 (5% in He) flow of 600 sccm. Sample was then treated in Piranha solution and silanized, following the procedure reported in section 2.2. GO was deposited on aminosilane-modified aSi, following the procedure reported in section 2.3. GO-deposited aSi sample (GO-aSi) was optically characterized in terms of spectroscopic reflectometry and photoluminescence. Figure S2 shows reflectivity spectra of bare aminosilane-modified aSi and of GO-aSi. A comparison between reflectivity and photoluminescence spectra of GO-aSi is reported in Figure S3.

Confocal microscopy imaging

Confocal microscopy is an imaging technique allowing to acquire single fluorescent focal plane excluding out-of-plane fluorescence. Confocal imaging of GO-PSi hybrid structure was performed using a LSM700 laser scanning microscope system (Carl Zeiss Inc., Peabody, MA), at 63x magnification. Sample fluorescence was excited at 488 nm. Images were acquired each $0.5\text{ }\mu\text{m}$ along the optical axis z. Figure S4A shows confocal microscopy images of GO infiltrated PSi layer; first image ($0\text{ }\mu\text{m}$) is referred to sample surface, last one ($-2.5\text{ }\mu\text{m}$) to the silicon substrate. Corresponding fluorescence intensities, calculated from images of Figure S4A using ImageJ software (<http://imagej.nih.gov/ij/>), are reported in Figure S4B.

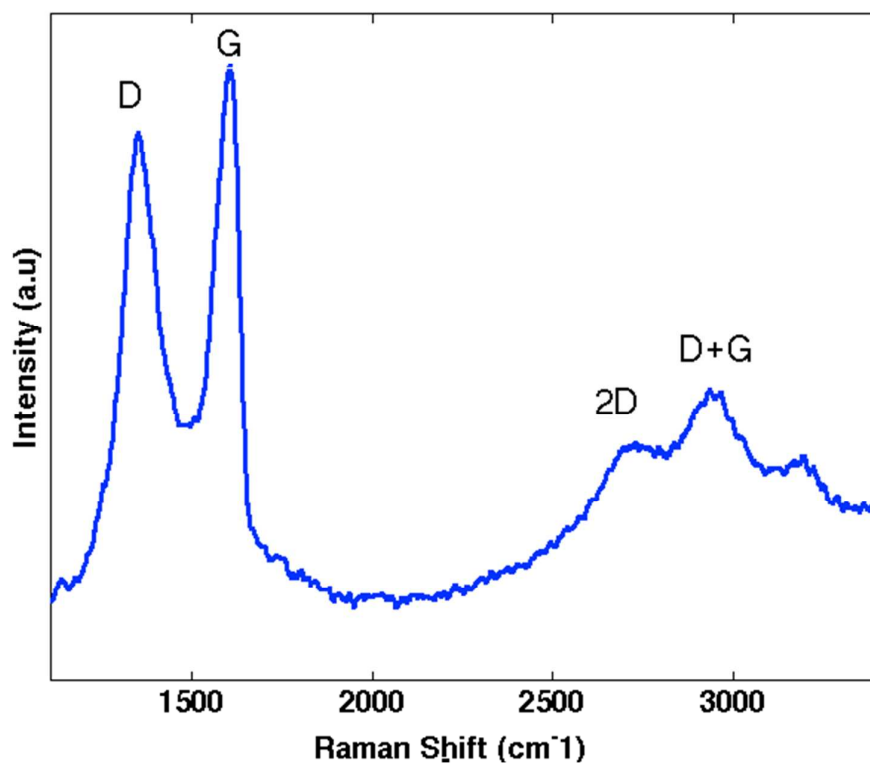


Figure S1. Raman spectrum of GO deposited on crystalline Si.

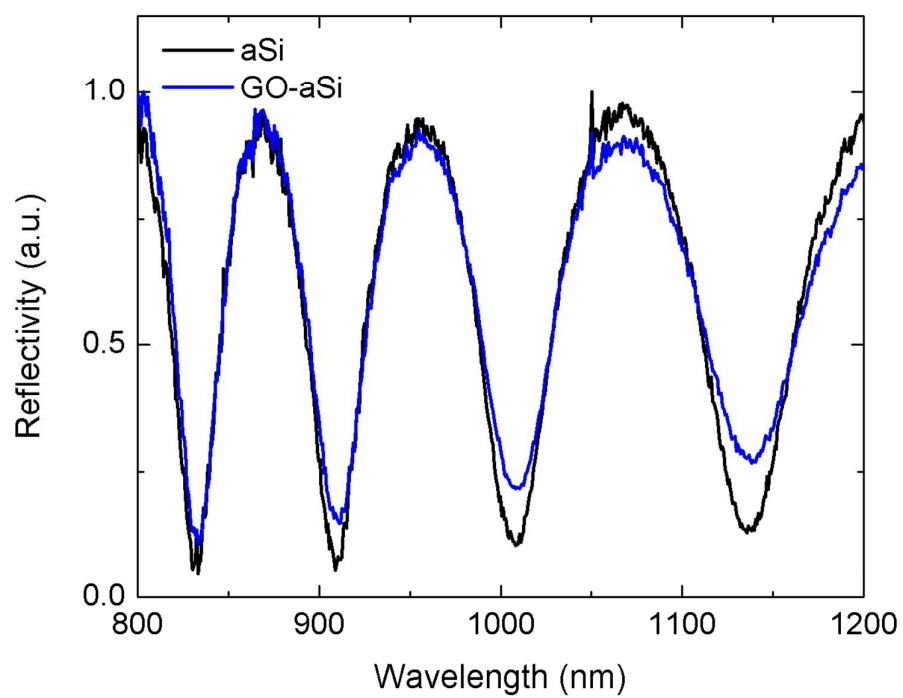


Figure S2. Reflectivity spectra of bare aminosilane-modified aSi and GO-aSi.

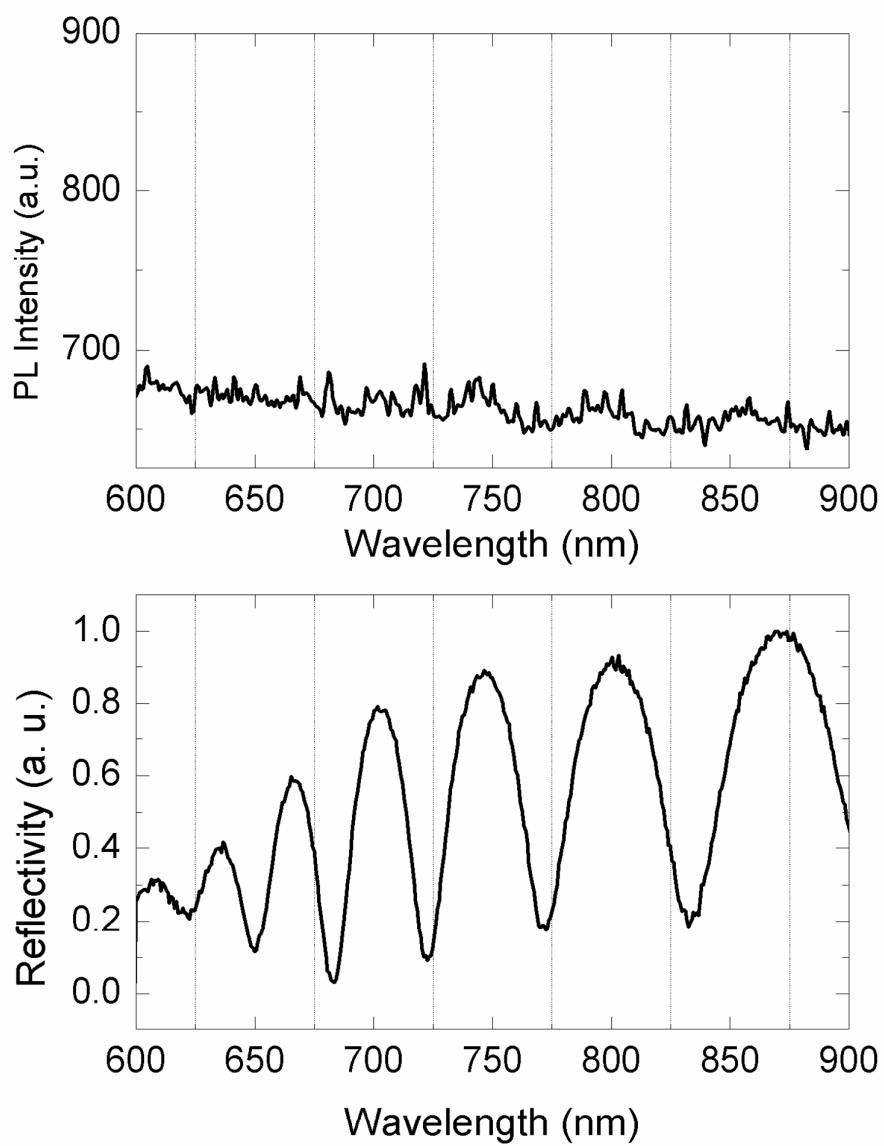


Figure S3. Comparison between photoluminescence spectrum (upper graph) and reflectivity spectrum (lower graph) of GO-deposited aSi.

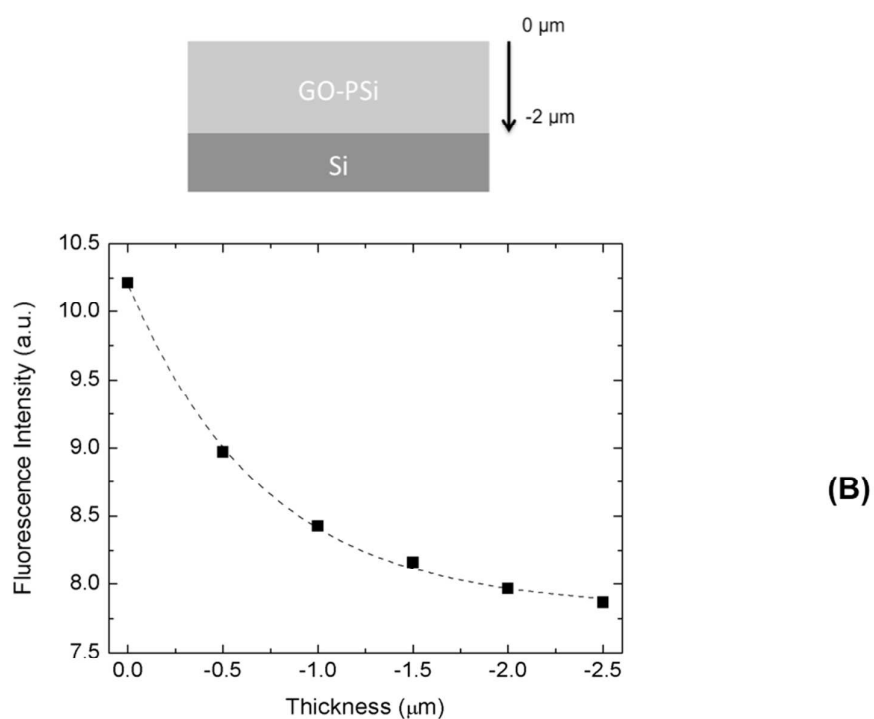
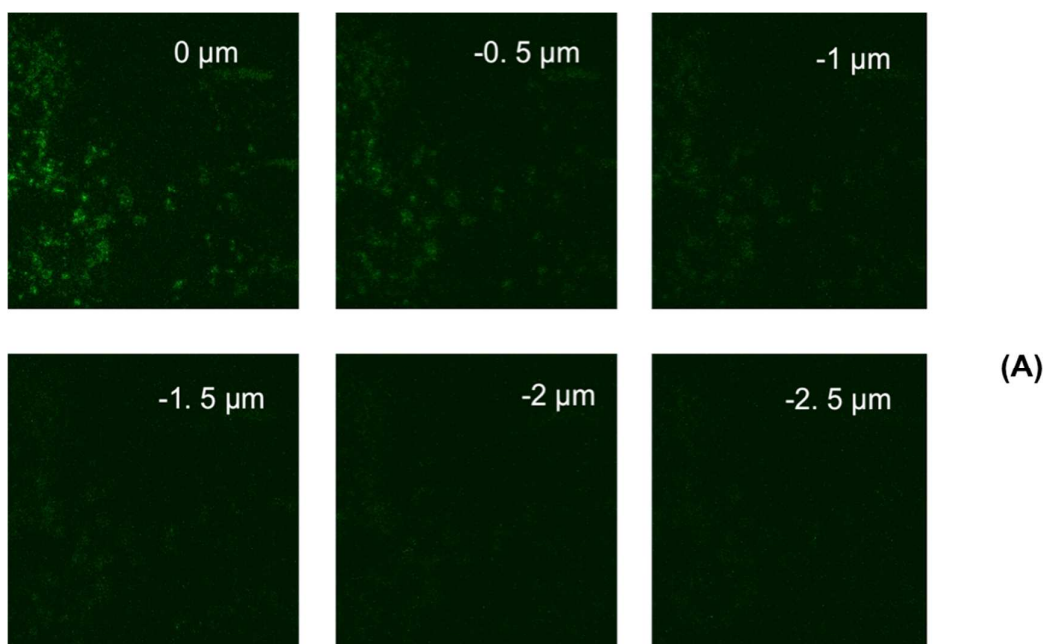


Figure S4. Confocal microscopy images of GO-PSi hybrid structure. The first image is referred to sample surface, the last one to silicon substrate (A). Fluorescence intensity profile estimated from confocal images (B).