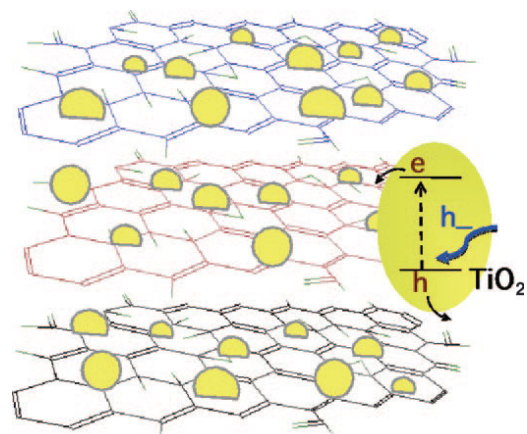


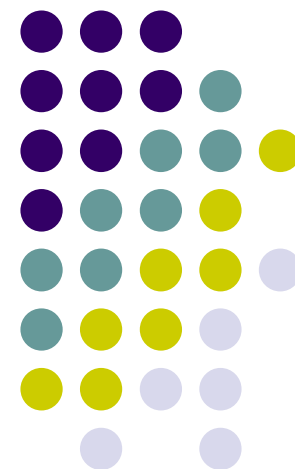
# “TiO<sub>2</sub>-Graphene Nanocomposites UV-Assisted Photocatalytic Reduction of Graphene Oxide”



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## TiO<sub>2</sub> nanoparticles

Dropwise addition of titanium  
Isopropoxide into vigorously  
stirred ethanol



TiO<sub>2</sub> nanoparticles of  
2 – 7 nm

## Graphite oxide

Graphite powder  
+  
H<sub>2</sub>SO<sub>4</sub> + NaNO<sub>3</sub> + KMnO<sub>4</sub>  
+  
H<sub>2</sub>O<sub>2</sub>



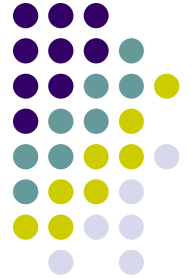
Graphite Oxide

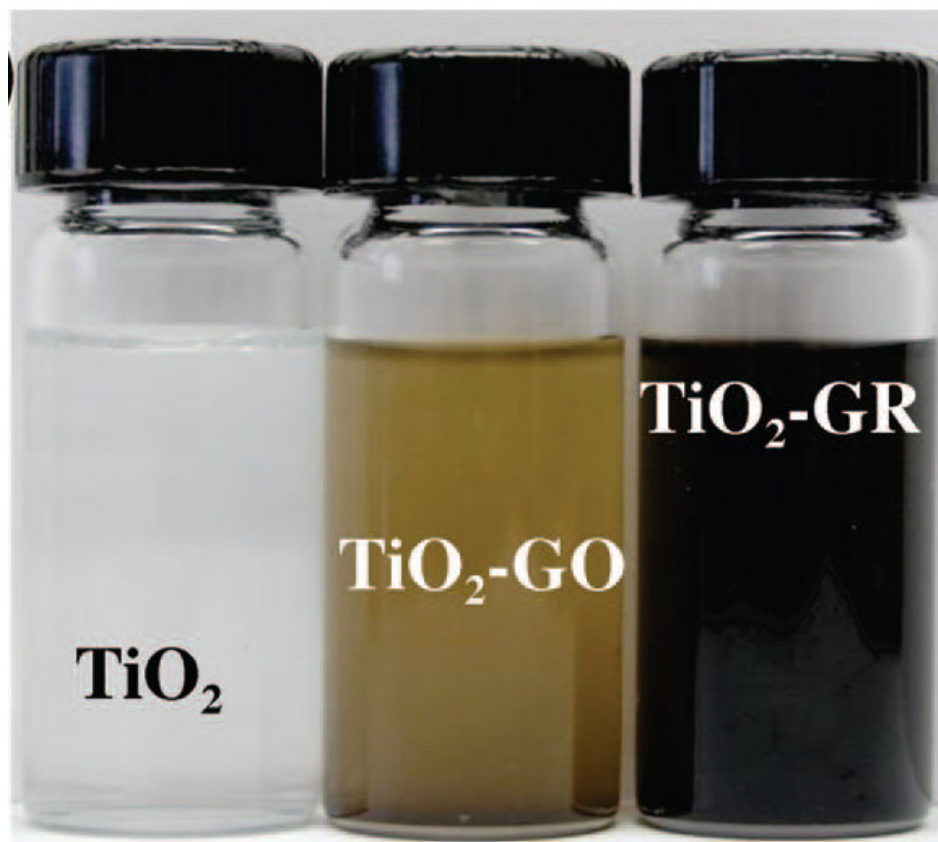
Sonicated for 30 min.

Graphite Oxide – TiO<sub>2</sub> nanocomposite

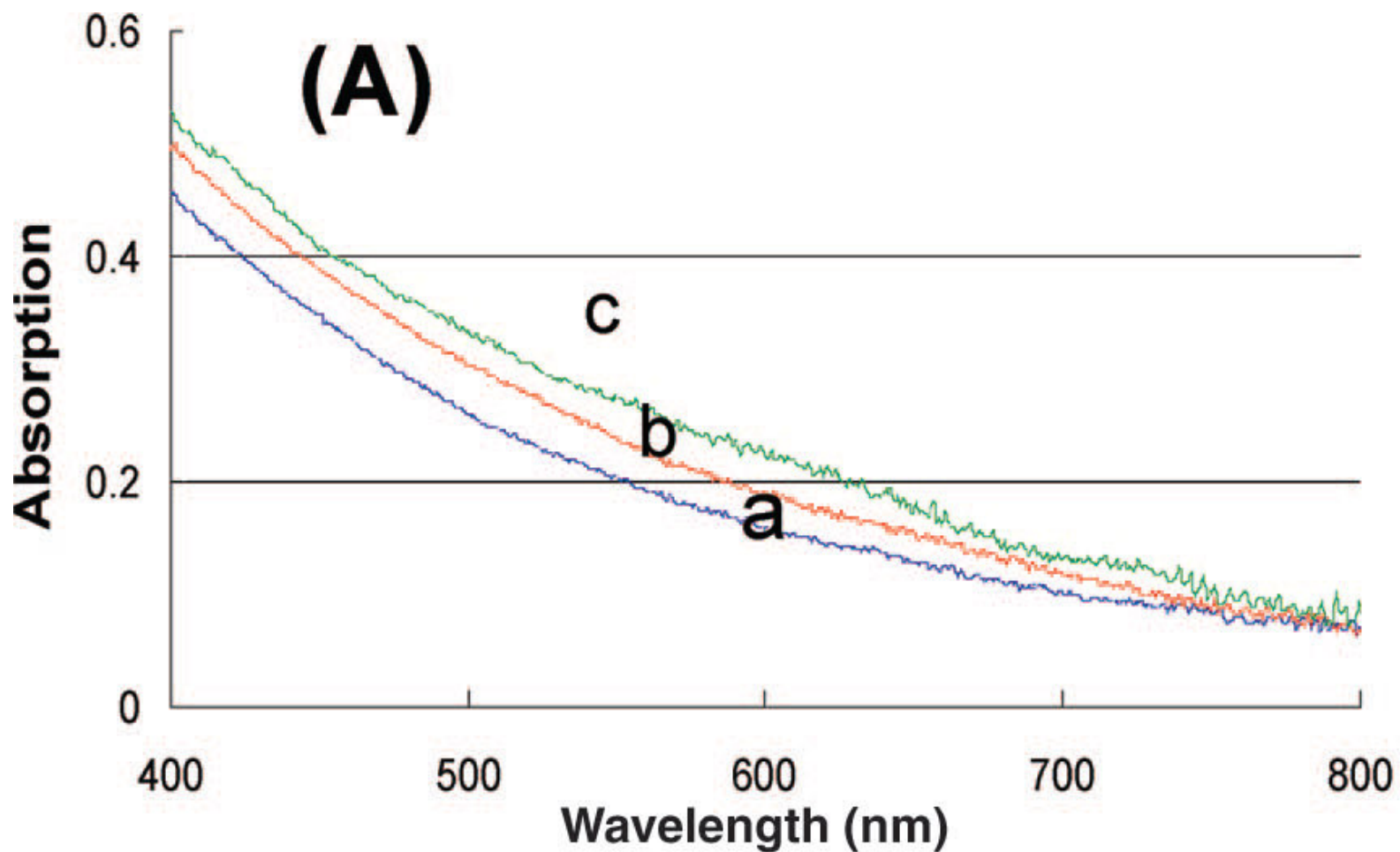
UV - irradiation

Graphene – TiO<sub>2</sub> nanocomposite

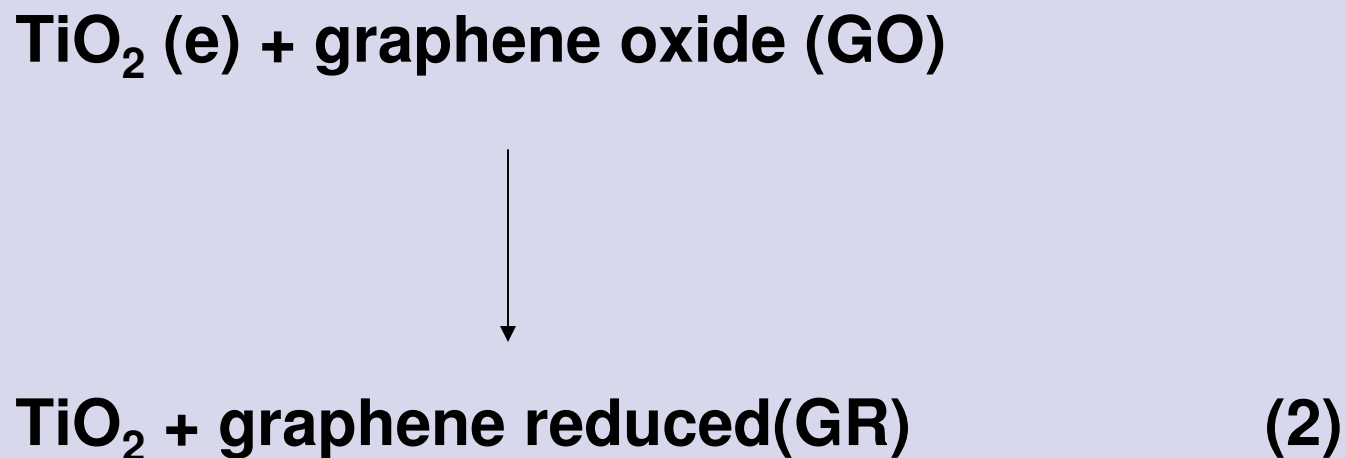
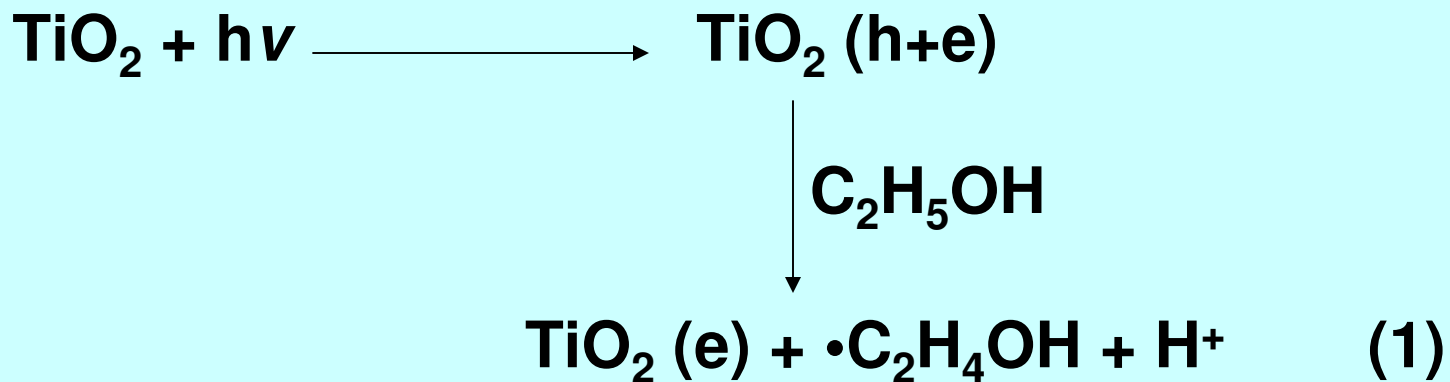


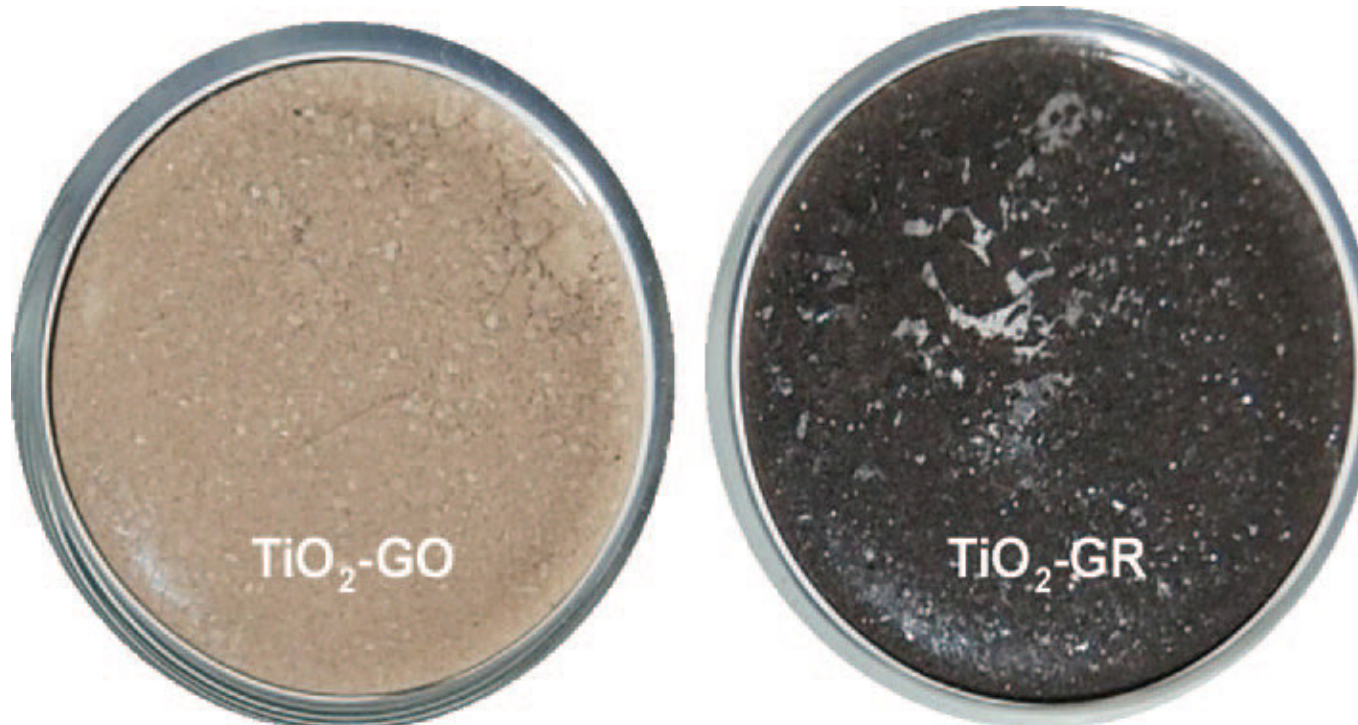


The change in color of a 10 mM solution of  $\text{TiO}_2$  nanoparticles with 0.5 mg/mL GO before and after UV irradiation for 2 h. A suspension of 10 mM  $\text{TiO}_2$  nanoparticles is also shown for comparison

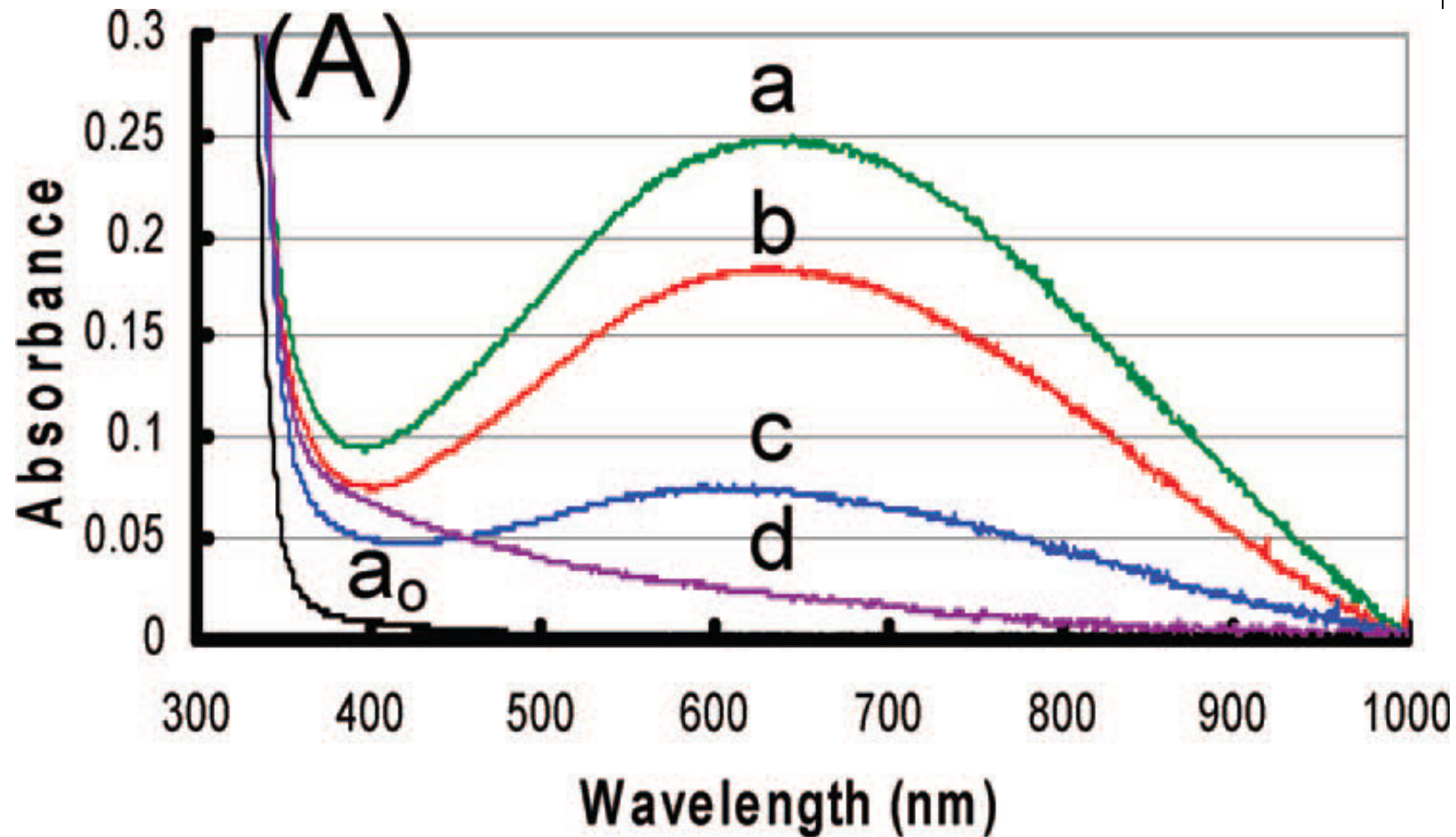


The absorption spectra of graphene oxide and  $\text{TiO}_2$  suspension in ethanol (a) before UV-irradiation, (b) after 5 min, and (c) after 15 min of UV irradiation

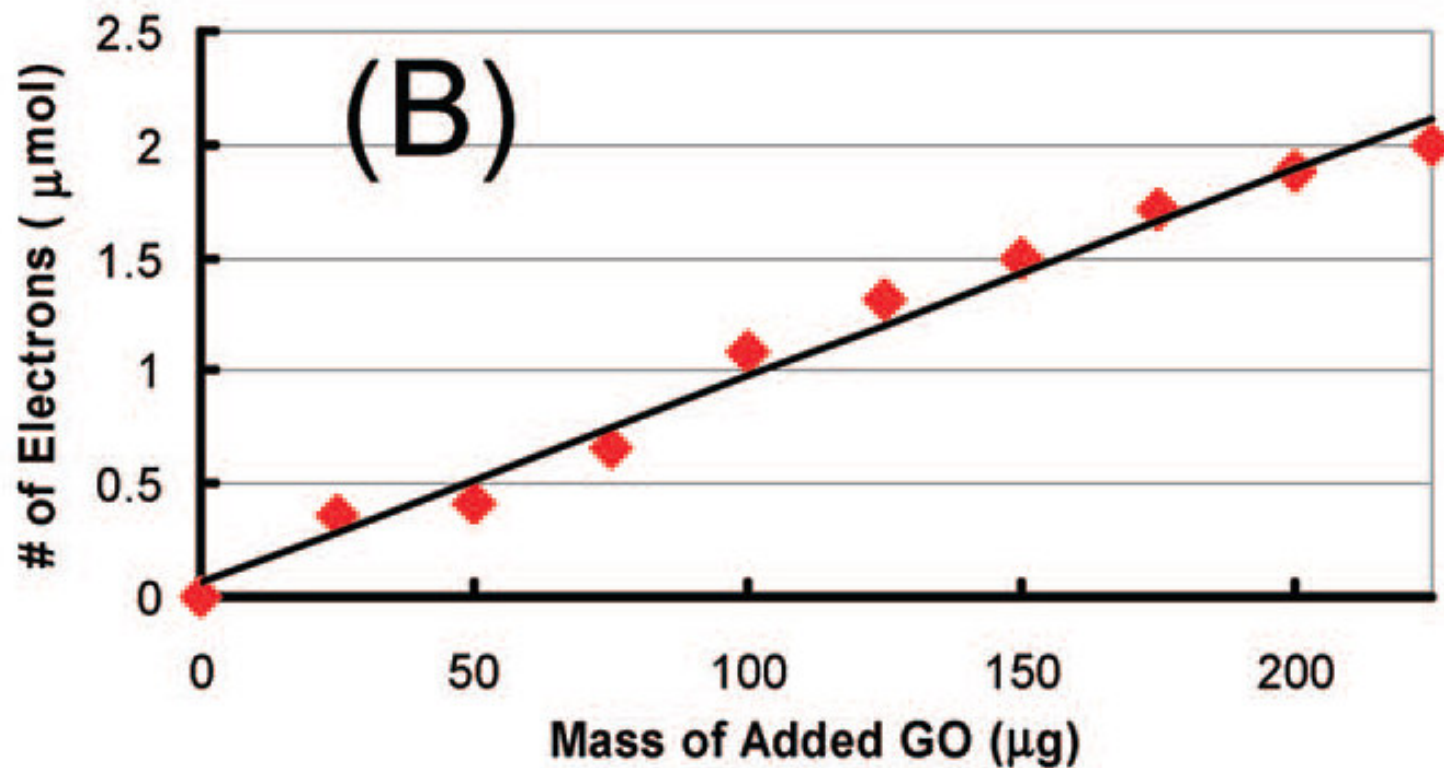




**$\text{TiO}_2$ -graphene oxide ( $\text{TiO}_2\text{GO}$ ) and  $\text{TiO}_2$  reduced graphene ( $\text{TiO}_2\text{GR}$ ) powders obtained after solvent evaporation and drying the samples at room temperature**

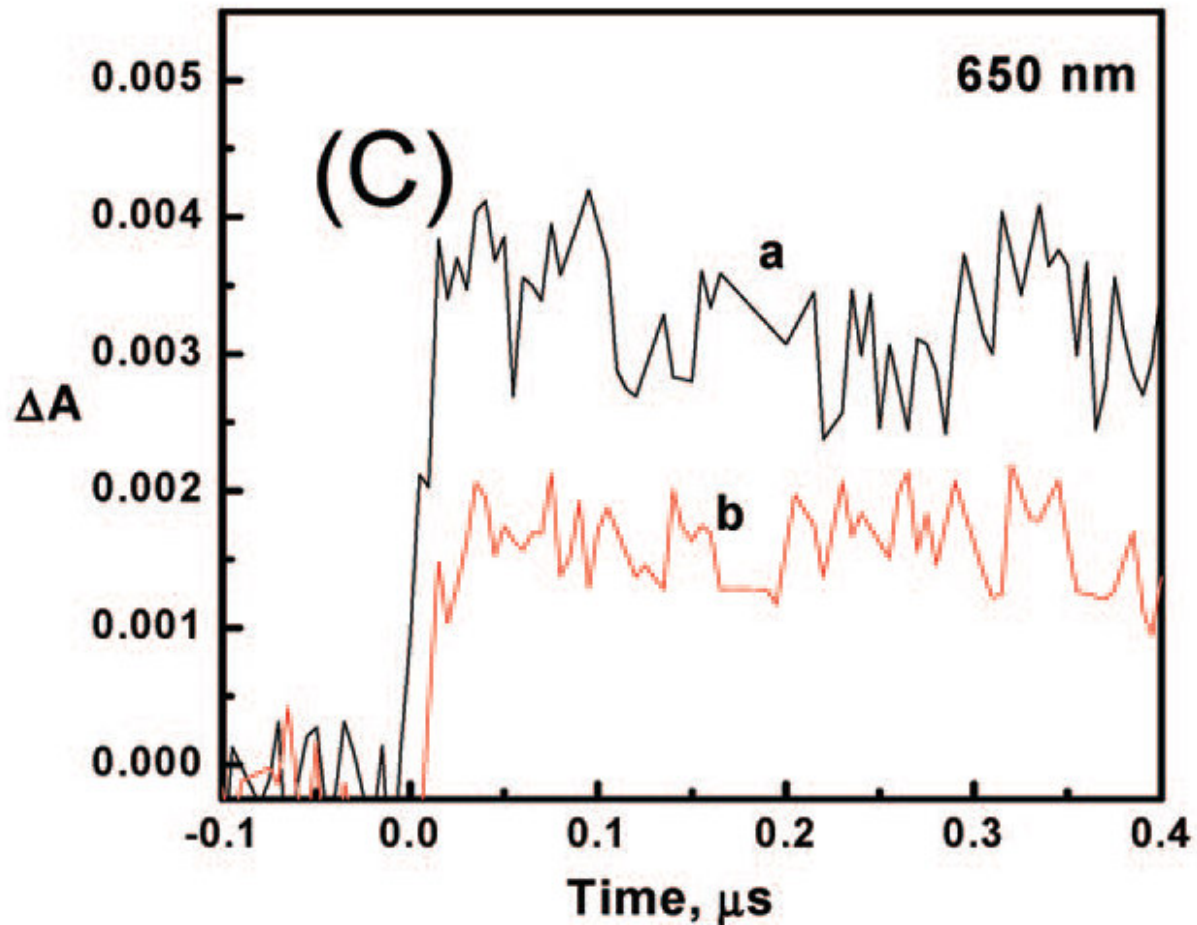


Absorption spectra of UV-irradiated 10 mM TiO<sub>2</sub> suspension in ethanol (spectrum a) and after the addition of graphene oxide suspension (deaerated): (a) 0, (b) 50, (c) 150, (d) 300 g GO (a<sub>0</sub> corresponds to TiO<sub>2</sub> suspension prior to UV irradiation)

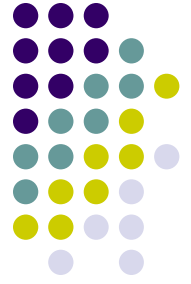
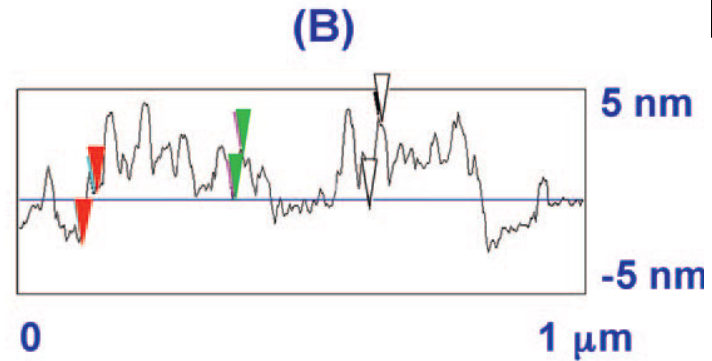
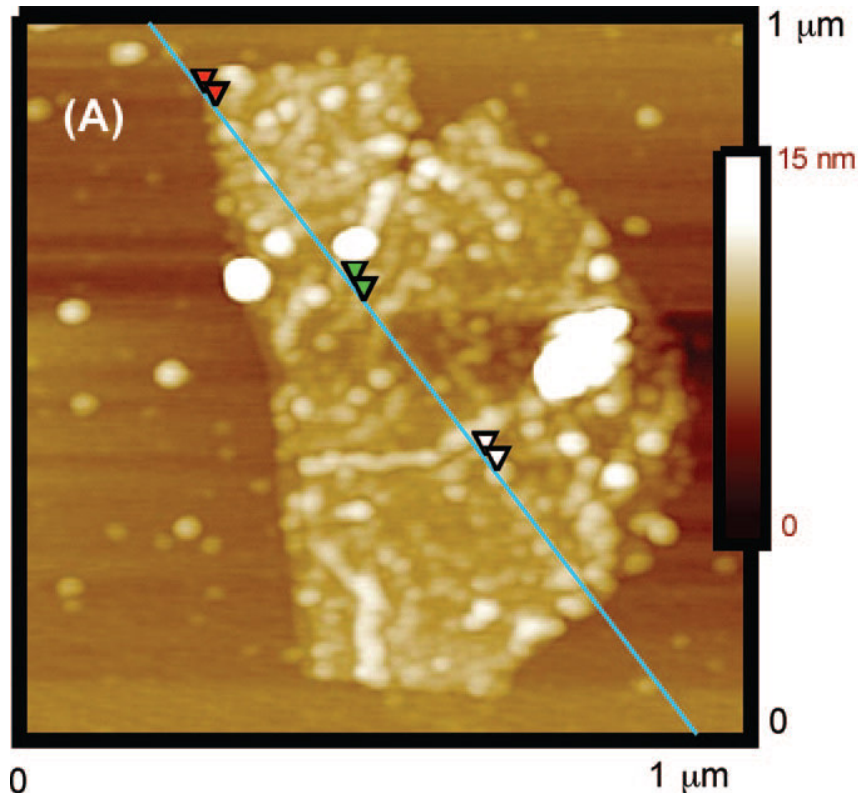


The dependence of electrons extracted from  $\text{TiO}_2$  on the amount of GO added to the suspension





Transient decay of trapped electrons in  $TiO_2$  recorded following 308 nm laser pulse excitation (a) without and (b) with 200 g GO



**(A) AFM image of TiO<sub>2</sub> GO.**

**(B) Depth profile of the line of interest on the graphene sheet. The red marker corresponds to a bilayer graphene sheet with a height of 2.2 nm, whereas the green and white markers correspond to nanoparticle sizes ranging from 2.6 to 4 nm, respectively. Additional cross-sections exhibited individual particle heights as great as 7 nm**



# Graphene Oxide – TiO<sub>2</sub> ---- Resistance

Before UV irradiation = 233 K $\Omega$

After UV irradiation = 30.5 K $\Omega$



## Conclusions

- **UV induced photocatalytic reduction of graphene oxide has been successfully carried out using  $\text{TiO}_2$  nanoparticles**
- **Well separated graphene- $\text{TiO}_2$  nanocomposite has been obtained**
- **Reduction in the resistance of the graphene – $\text{TiO}_2$  nanocomposite has been found after UV irradiation**