Graphene functionalized with TiO_2 for Nanocomposites.

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Abstract

Graphene has attracted great interest since their discovery in 2004 by Geim and Novoselov [1], its excellent mechanical (Young's modulus ~1TPa and strength 130GPa [2]), electrical (quantum hall effects [3] mobility of suspended graphene 230,000cm^2 Vs[4]), thermal conductivity (between 3080-5150$Wm^{-1}K^{-1}$ [5,6]) and optical properties [7]makes it promising for variety of applications in the areas such as solar-cells, [8] energy storage, [9] sensors [10] and nanocomposites.[11]TiO_2 nanoparticles have a extraordinary photocatalytic properties[12] and thermoplastic polymer was a good stable holder to engineering application.

Here, we present a method to prepare sensor nanocomposites based on graphene oxide, ***GO***, sheets functionalized with TiO_2, ***GOTiO₂***. ***GOTiO₂*** sheets were characterized by high resolution transmission electron microscopy, ***HRTEM*** (figure 1), thermogravimetry analysis, ***TGA*** and ***Raman*** techniques.

Nanocomposites were prepared mixing (three-roll milling[13]) the nanoparticles with two thermoplastic polymers: polystyrene, ***PS***, and polyvinylene fluoride, ***PVDF***. The sensors were characterized by scanning electron microscopy, ***SEM***, dynamic mechanical thermal analysis, ***DMTA***, to evaluate the mechanical properties, differential scanning calorimetry, ***DSC*** , X ray diffraction, ***XRD***, electrical conductivity and field emission measurements. Their response as laser photosensors (figure 2) was evaluated at two wavelengths, red and green (5mW) using a Keithley source-meter as shown in figure 3.

References

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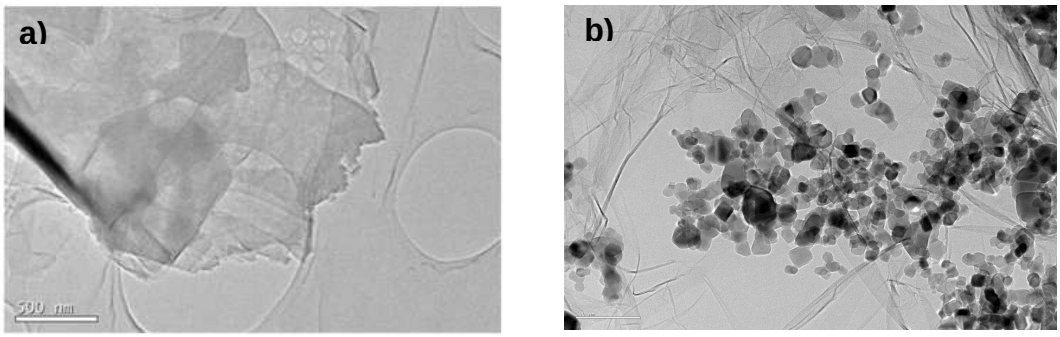

Figure 1. HRTEM image of a)GO and b) GO with TiO_2 nanoparticles on its surface.

Figure 2. Photosensor of a sample of nanocomposite with graphene oxide.

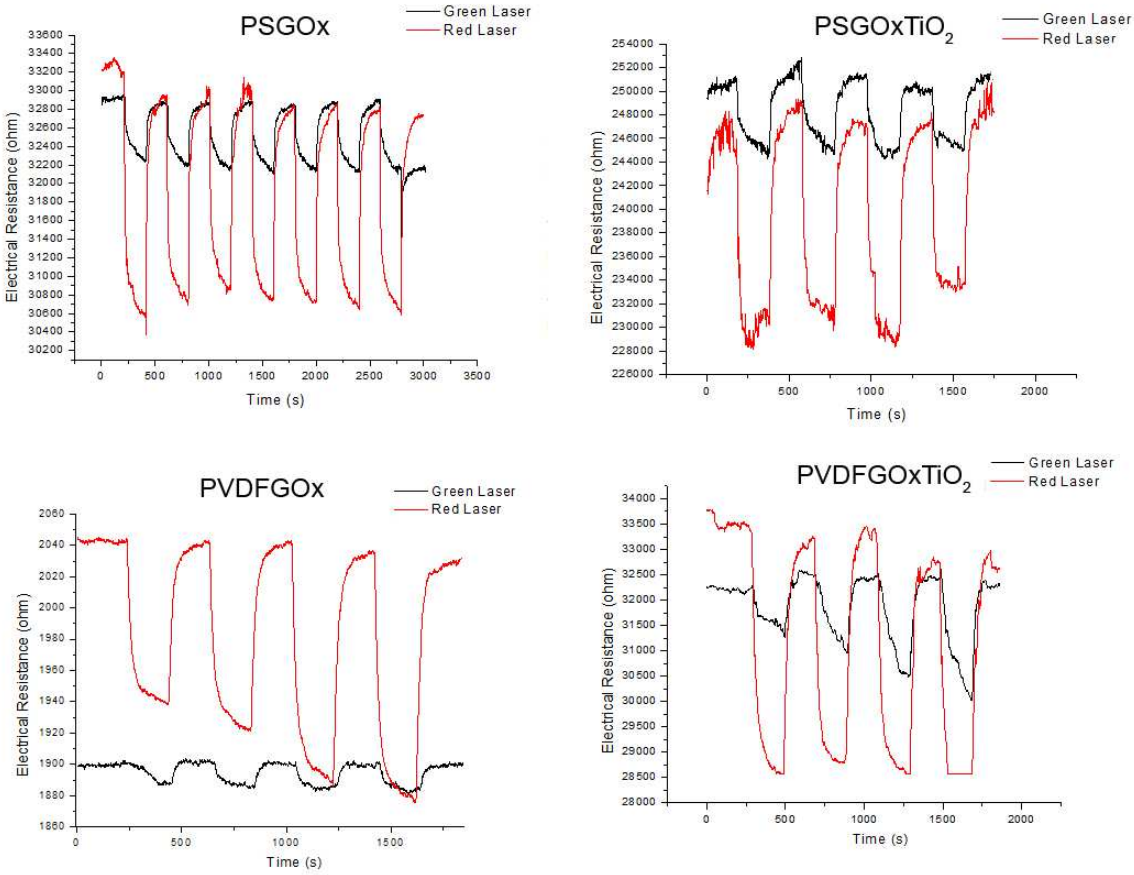

Figure 3. Photosensor response for all the nanocomposites when a Laser Red and Green is positioned on the sample the cycle correspond to turn off and on, respectively.