Graphene-based@metal oxides photocatalysts for (waste)water treatment: Synthesis, characterization and evaluation of pharmaceuticals photodegradation

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The occurrence of pharmaceutical wastes in water is a global problem for the public health. Although many methods were reported for their removal from water, the photocatalytic oxidation process emerged as one of the most significant over the rest. It is well established that this process dominantly employs TiO2 semiconductor owing to its high synergetic oxidation strength, zero toxicity, and great chemical and biological stability. To improve the optical absorption and enhance the charge carrier transport, reduced graphene oxide (rGO) synthesized laboratory [1] was used in the hybrids. Thus, a narrow in the bandgap and attenuation in the electron-hole recombination rate was occurred. The hybrids were doped with zinc (Zn) and aluminum (Al) nanoparticles acting as anchoring sites for the drugs.
A series of rGO-TiO2-ZnO-AlO nanocomposites were synthesized by a one-step hydrothermal method, and applied to photoreduction of pharmaceutical wastes Venlafaxin (antidepressant). The composites and the raw materials were characterized with Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), X-ray Diffraction (XRD) (Fig.1), N2 porosimetry (BET), Raman spectroscopy (Fig.1), Atomic Force Microscopy (AFM) and Diffuse Reflectance Absorption Spectra (UV-Vis DRS). The effect of each dopant on the photocatalytic performance of TiO2/rGO was evaluated.

References

[1] D.G. Trikkaliotis, A.C. Mitropoulos, G.Z. Kyzas, "Low-cost route for top-down synthesis of over- and low-oxidized graphene oxide", Colloids and Surfaces A: Physicochemical and Engineering Aspect 600 (2020) Article number 124928 (doi: 10.1016/j.colsurfa.2020.124928)

Figures

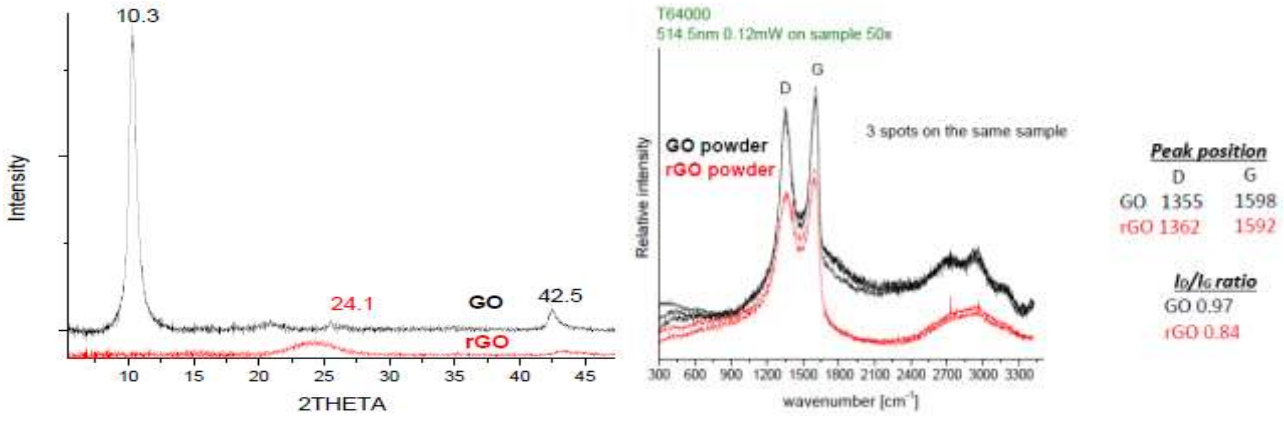

Figure 1: XRD and Raman spectra of the synthesized GO and rGO.

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