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Article

Graphene-Based TiO_2 Nanocomposite for Photocatalytic Degradation of Dyes in Aqueous Solution under Solar-like Radiation

Martina Kocijan [1*], Lidija Ćurković [1*], Davor Ljubas [1], Katarina Mužina [2], Ivana Bačić [3], Tina Radošević [4], Matejka Podlogar [4], Igor Bdikin [5], Gonzalo Otero-Irurueta [5], María J. Hortigüela [5], Gil Gonçalves [5*]

[1] Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia; martina.kocijan@fsb.hr (M.K.); lidija.curkovic@fsb.hr (L.Ć.); davor.ljubas@fsb.hr (D.LJ.)
[2] Faculty of Chemical Engineering and Technology, University of Zagreb, Trg Marka Marulića 20, 10000 Zagreb, Croatia; kmuzina@fkit.hr (K.M.)
[3] Forensic Science Centre ''Ivan Vučetić'', Ministry of the Interior, Ilica 335, 10000 Zagreb, Croatia; ivana.bacic@mup.hr (I.B.)
[4] Jožef Stefan Institute, Jamova cesta 39, SI-1000, Ljubljana, Slovenia; tina.radosevic@ijs.si (T.R.); matejka.podlogar@ijs.si (M.P.)
[5] Centre for Mechanical Technology and Automation (TEMA), University of Aveiro, 3810-193 Aveiro, Portugal; bdikin@ua.pt (I.B.); otero.gonzalo@ua.pt (G.O.I.); mhortiguela@ua.pt (M.J.G.); ggoncalves@ua.pt (G.G.)
* Correspondence: martina.kocijan@fsb.hr (M.K.); lidija.curkovic@fsb.hr (L.Ć.); ggoncalves@ua.pt (G.G.);

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Supplementary Materials

Homogeneous graphene films and layered structure are shown (Fig. S1A) in the synthesized GO. Fig. S1B is shown the characteristic ultrathin wrinkled sheets of rGO with pronounced edges. On the rGO surface were no found impurities. It has been observed that the reduction process successfully removed oxygen groups which have confirmed by SEM analysis of GO and rGO.

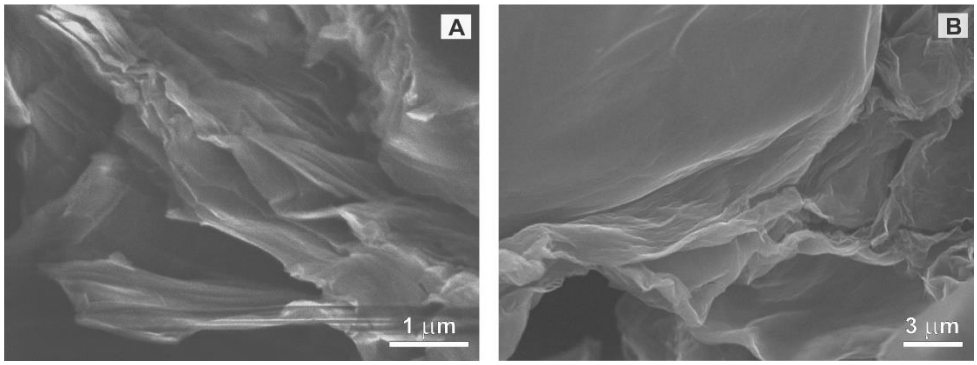

Figure S1. SEM images of (A) synthesized GO and (B) prepared rGO

Fig S2 depicts the distribution of elements in synthesized TiO_2@rGO nanocomposite with 15 wt.% of rGO photocatalyst prepared by the hydrothermal method and annealed at 300°C which was composed of titanium, carbon, and oxygen. The signals from O and Ti are from the synthesized pure TiO_2 particles while the signal for C mainly originates from the rGO sheets. It has been observed that mentioned elements are properly dispersed in synthesized nanocomposite material.

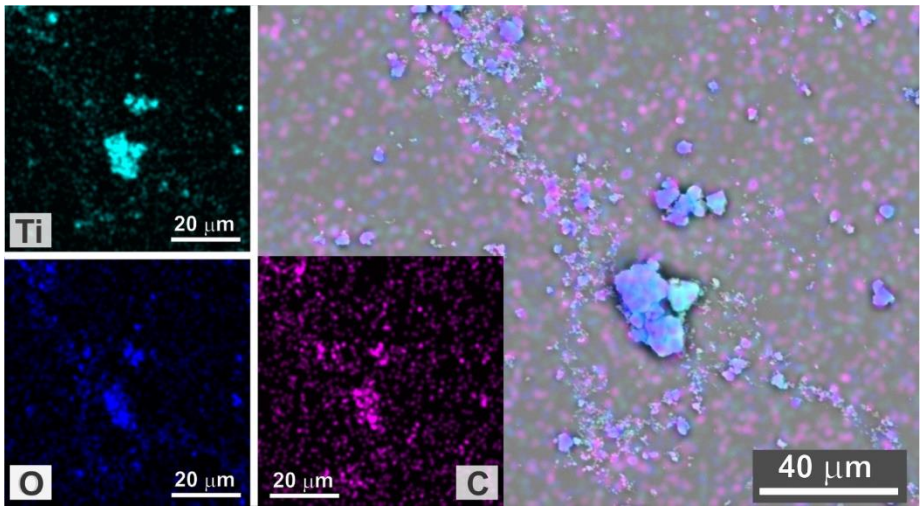

Figure S2 SEM image of TiO_2@rGO nanostructures (15 wt.% of rGO) at calcination temperature of 300 °C. SEM micrograph of surface, and element mappings: titan, carbon, and oxygen.

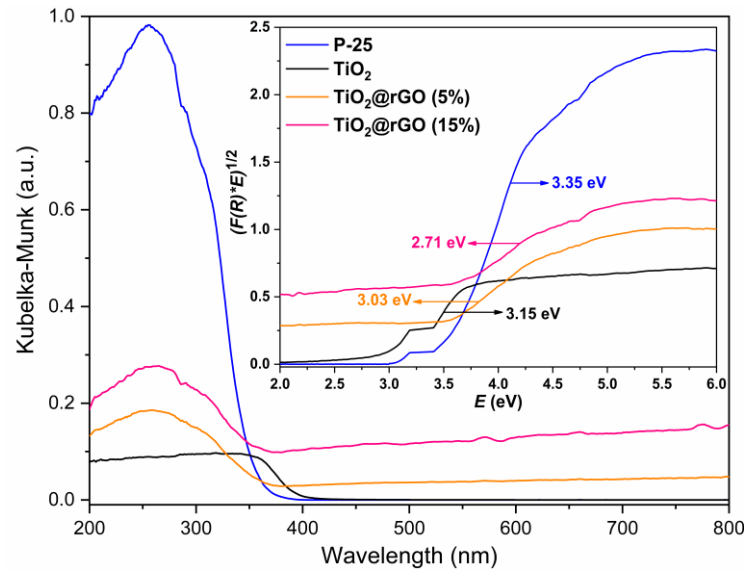

Figure S3. The absorption threshold energy and the band gap energy of synthesized pure TiO_2 particles and nanocomposites TiO_2@rGO with 5 wt% and 15 wt.% of rGO thermal treated at 300 °C and reference P-25 material.

SEM analysis was carried out after photocatalytic performances to get morphological information of synthesized photocatalysts after their usage. The SEM micrographs were presented in Fig S4 A-D. SEM images were demonstrated that after photocatalytic performances into MB dye solution, the morphology of synthesized photocatalysts it remained unchanged. The pure TiO_2 particles are still disturbed uniformly with a spherical shape but after drying in the oven they are more in agglomerated form. Further, it can also be seen on the morphology of nanocomposites but with a significant agglomeration form.

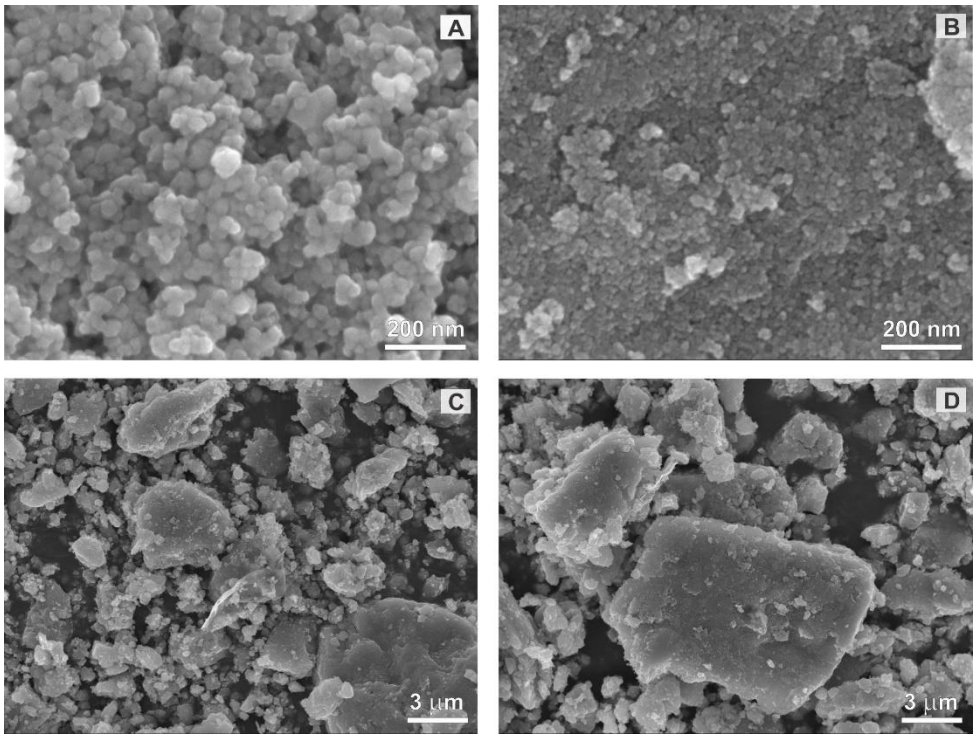

Figure S4. SEM images of the (A) P-25; (B) synthesized TiO_2; (C) TiO_2@rGO nanocomposite with 5 wt.% of rGO; and (D) TiO_2@rGO nanocomposite with 15 wt.% of rGO after performed photocatalytic tests during 120 minutes in MB dye solution.

Table S1. Set up of measurement parameters of the photocatalytic test.

Parameters	Values
The concentration of the pollutant model solution	10 mg/L
Concentration of catalyst	0.5 mg/mL
Temperature of reaction	22.0 ± 0.5 °C
Source of irradiation	Solar-like bulb
Stirring rate	300 rpm
Time of reaction	120 minutes
The distance between light source and reactor	20 cm
Intensity of the irradiation	3.25 ± 0.25 $mWcm^{-2}$