ELMINA 2022

SECOND INTERNATIONAL CONFERENCE ON ELECTRON MICROSCOPY OF NANOSTRUCTURES

ДРУГА МЕЂУНАРОДНА КОНФЕРЕНЦИЈА О ЕЛЕКТРОНСКОЈ МИКРОСКОПИЈИ НАНОСТРУКТУРА

August 22nd–26th, 2022, Belgrade, Serbia
22–26. август 2022. Београд, Србија

SECOND INTERNATIONAL CONFERENCE

ELMINA 2022

Serbian Academy of Sciences and Arts, Belgrade, Serbia
August 22nd-26th, 2022
http://elmina.tmf.bg.ac.rs

Program and Book of Abstracts

Organized by:
Serbian Academy of Sciences and Arts
and
Faculty of Technology and Metallurgy, University of Belgrade

Endorsed by:
European Microscopy Society
and
Federation of European Materials Societies

Title: SECOND INTERNATIONAL CONFERENCE
ELMINA 2022
Program and Book of Abstracts

Publisher: Serbian Academy of Sciences and Arts
Knez Mihailova 35, 11000 Belgrade, Serbia
Phone: +381 11 2027200
https://www.sanu.ac.rs/en/

Editors: Velimir R. Radmilović and Vuk V. Radmilović

Technical Editor: Vuk V. Radmilović

Cover page: Raša Hindawi

Printed in: Serbian Academy of Sciences and Arts
Knez Mihailova 35, 11000 Belgrade, Serbia
Phone: +381 11 2027128
stamparija@sanu.ac.rs
Circulation: 55 copies.

Carbon quantum dots-assisted CdS/TiO_2 heterojunction for photocatalytic reduction of hexavalent chromium under visible light

Jana Petrović[1], Slavica Lazarević[1], Nemanja Barać[2], Vukašin Ugrinović[2], Đorđe Janaćković[1] and Rada Petrović[1]

1 University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Serbia

2 Innovation Center of Faculty of Technology and Metallurgy, Ltd, Belgrade, Serbia

In the field of photocatalysis, various semiconductor materials have been widely used, precisely because of their electronic structure, which allows them to operate under the different types of irradiations. Titanium dioxide, TiO_2, is the most widely used photocatalyst due to its biological and chemical inertness, non-toxicity, availability and affordability. Nevertheless, the inefficient utilization of visible light and high recombination rate of electrons and holes, limit its practical application. Two types of modifications have been used to improve certain properties of TiO_2 and take the advantages of the good ones: changing the phase structure, crystallinity, or morphology and combining with various ions, noble metals, semiconductors or other materials by doping, deposition, or sensitization [1,2]. In this work, sol-gel synthesized TiO_2 [3] was modified by depositing carbon quantum dots (CQD) and/or cadmium sulfide, CdS, in order to form heterojunctions and so-called "Z" scheme [4]. CQDs were deposited by decomposition of citric acid in hydrothermal conditions (sample CQD-TiO_2), and CdS by thermal decomposition of thiourea in the presence of cadmium acetate (samples CQD-TiO_2 and CQD-TiO_2-CdS).

FESEM showed that TiO_2 is formed from relatively spherical particles of different sizes, which are composed of spherical nanoparticles, whose sizes are < 50 nm (Fig. 1a). It was not possible to clearly distinguish CQD particles in the sample CQD-TiO_2 by FESEM, but the beige color of the sample indicated the presence of CQD. FESEM and EDS analyzes of the samples CQD-TiO_2 and CQD-TiO_2-CdS confirmed the presence of randomly dispersed CdS nanoparticles on the surface of TiO_2 (Fig. 1b). Diffusion reflection spectroscopy (DRS) showed that the deposition of CQD slightly increased the light absorption limit of TiO_2, but also led to additional absorption in the visible part of the spectrum (Fig. 2). CdS is considered responsible for shifting the absorption limit of TiO_2-CdS and CQD -TiO_2-CdS up to ~530 nm (Fig. 2).

The obtained photocatalysts were used for photocatalytic reduction of Cr(VI) under simulated visible irradiation, at pH = 3. As it was expected, pure TiO_2 was inactive due to the wide band gap. The photocatalytic activity of CQD-TiO_2 was improved compared to pure TiO_2, thanks to CQD that expand the range of light absorption. While studying the photocatalytic activity of TiO_2-CdS, the concentration of Cr(VI) decreased during equilibration in the dark. The presence of Cd^{2+} in the solution, determined by atomic absorption spectroscopy, indicated CdS corrosion due to low pH values, so it is possible for S^{2-} ions to reduce Cr(VI). When comparing the overall performance of the samples with CdS, CQD -TiO_2-CdS had a much smaller decrease in Cr(VI) concentration during equilibration in the dark and better photocatalytic efficiency compared to TiO_2-CdS, which can be attributed to the presence of carbon nanoparticles and probably the formation of "Z" scheme, which provides significantly higher efficiency of photocatalysts than heterojunction type II, which is formed in TiO_2-CdS. The CQD-TiO_2 and CQD-TiO_2-CdS photocatalysts represent a good basis for further research with the aim of removing harmful Cr(VI) from waste streams.

CIP – Каталогизација у публикацији
Народна библиотека Србије, Београд

66.017/.018(048)
544.2(048)
621.385.833.2(048)

INTERNATIONAL Conference on Electron Microscopy of Nanostructures ELMINA (2 ; 2022 ; Beograd)
Program ; & Book of Abstracts / Second International Conference ELMINA [Electron Microscopy of Nanostructures] 2022, Belgrade, Serbia, August 22nd-26th, 2022 ; organized by Serbian Academy of Sciences and Arts and University of Belgrade, Faculty of Technology and Metallurgy ; [editors Velimir R. Radmilović and Vuk V. Radmilović]. - Belgrade : SASA, 2022 (Belgrade : SASA). - 223 str. : ilustr. ; 30 cm

Na nasl. str.: European Microscopy Society and Federation of European Materials Societies. - Tiraž 55. - Bibliografija uz svaki apstrakt. - Registar.

ISBN 978-86-7025-943-0

а) Наука о материјалима -- Апстракти б) Нанотехнологија -- Апстракти в) Електронска микроскопија -- Апстракти

COBISS.SR-ID 72022025