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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
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		c. Thn Terbit, Tempat Pelaks.	:	12-14 November, Lombok
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		e. Alamat Repository/Web	:	https://www.scientific.net/MSF.827.56
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Bidang Ilmu: Fisika

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d. Kelengkapan unsur dan kualitas terbitan /prosiding (30%)	9		7,87
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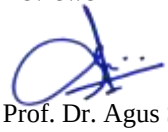

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f. Ruang lingkup dan kedalaman pembahasan (30%)	9		8,70
g. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	9		8,70
h. Kelengkapan unsur dan kualitas terbitan /prosiding (30%)	9		8,62
Total = (100%)	**30**		**28,80**
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   Artikel membahas karakteristik optis Zn-doped CeO2 berdasarkan pengukuran spektrum absorpsi menggunakan spektrofotometer UV-Vis. Selain itu dikemukakan karakteristik fotokatalisisnya. Absorbsi UV tinggi dan sifat fotokatalis rendah sangat diperlukan sebagai material pelindung radiasi UV.. Hasil yang dipresentasikan dalam artikel menunjukkan kedalaman ruang lingkup dan pembahasan yang sangat baik.
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UV-Light absorption and photocatalytic properties of Zn-doped CeO_2 nanopowders prepared by ultrasound irradiation

Efendi, Aula Fitra ; Nurhasanah, Iis
Save all to author list

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Abstract

Ceria (CeO_2) nanopowders doped with various Zinc (Zn) compositions were synthesized from solution by irradiating ultrasound waves. Ultrasound waves were irradiated to aqueous/isopropanol solution of cerium nitrate and zinc nitrate mixtures. Aqueous solution of ammonium hydroxide was droped into

that solution until pH becomes 10. Dried precipitates were calcined at 100°C to form CeO_2 nanopowders. X-ray Diffraction (XRD) analysis shows the CeO_2 nanopowder possess fluorite cubic structure. Ultrasound irradiation resulted in nano-metric powder of CeO_2 with spherical in shape. The addition of Zn into CeO_2 reduces the particle size and shows strong absorbance in the ultra–violet (UV) region. Moreover, the addition of 20 mol% Zn is inhibiting photocatalytic activity of CeO_2 under sunlight irradiation. These results suggest that Zndoped CeO_2 is more promising for UV radiation protection with no presence photocatalytic activity.

Author keywords

Ceria (CeO_2); Nanostructures; Optical properties; Ultrasound irradiation

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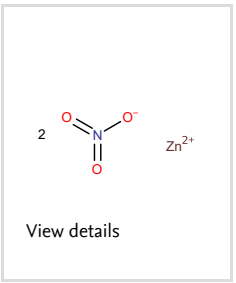

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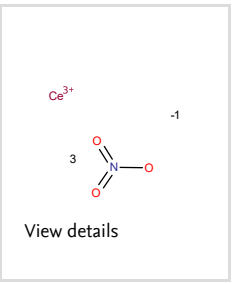

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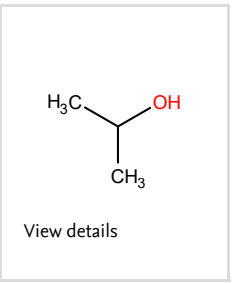

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1 Sujana, M.G., Chattopadyay, K.K., Anand, S.

Characterization and optical properties of nano-ceria synthesized by surfactant-mediated precipitation technique in mixed solvent system

(2008) *Applied Surface Science*, 254 (22), pp. 7405-7409. Cited 89 times.
http://www.journals.elsevier.com/applied-surface-science/
doi: 10.1016/j.apsusc.2008.05.341

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2 Goharshadi, E.K., Samiee, S., Nancarrow, P.

Fabrication of cerium oxide nanoparticles: Characterization and optical properties

(2011) *Journal of Colloid and Interface Science*, 356 (2), pp. 473-480. Cited 256 times.
doi: 10.1016/j.jcis.2011.01.063

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3 Lima, J.F.d., Martins, R.F., Neri, C.R., Serra, O.A.

ZnO:CeO 2 -based nanopowders with low catalytic activity as UV absorbers (Open Access)

(2009) *Applied Surface Science*, 255 (22), pp. 9006-9009. Cited 92 times.
http://www.journals.elsevier.com/applied-surface-science/
doi: 10.1016/j.apsusc.2009.06.071

View at Publisher

4 Nurhasanah, I., Sutanto, H., Futikhaningtyas, R.

Optical properties of Zn-doped CeO_2 nanoparticles as function of Zn content

(2014) *Advanced Materials Research*, 896, pp. 108-111. Cited 17 times.
ISBN: 978-303835031-6
doi: 10.4028/www.scientific.net/AMR.896.108

View at Publisher

5 Chu, X., Chung, W.-i., Schmidt, L.D.

Sintering of Sol—Gel-Prepared Submicrometer Particles Studied by Transmission Electron Microscopy

(1993) *Journal of the American Ceramic Society*, 76 (8), pp. 2115-2118. Cited 121 times.
doi: 10.1111/j.1151-2916.1993.tb08344.x

View at Publisher

6 Pinjari, D.V., Pandit, A.B.

Room temperature synthesis of crystalline CeO_2 nanopowder: Advantage of sonochemical method over conventional method

(2011) *Ultrasonics Sonochemistry*, 18 (5), pp. 1118-1123. Cited 122 times.
www.elsevier.com/inca/publications/store/5/2/5/4/5/1
doi: 10.1016/j.ultsonch.2011.01.008

View at Publisher

7 Kandjani, A.E., Tabriz, M.F., Pourabbas, B.

Sonochemical synthesis of ZnO nanoparticles: The effect of temperature and sonication power

(2008) *Materials Research Bulletin*, 43 (3), pp. 645-654. Cited 82 times.
doi: 10.1016/j.materresbull.2007.04.005

View at Publisher

8 Moholkar, V.S., Sable, S.P., Pandit, A.B.

Mapping the cavitation intensity in an ultrasonic bath using the acoustic emission

(2000) *AIChE Journal*, 46 (4), pp. 684-694. Cited 144 times.
www.interscience.wiley.com
doi: 10.1002/aic.690460404

View at Publisher

9 Mahulkar, A.V., Riedel, C., Gogate, P.R., Neis, U., Pandit, A.B.

Effect of dissolved gas on efficacy of sonochemical reactors for microbial cell disruption: Experimental and numerical analysis

(2009) *Ultrasonics Sonochemistry*, 16 (5), pp. 635-643. Cited 32 times.
www.elsevier.com/inca/publications/store/5/2/5/4/5/1
doi: 10.1016/j.ultsonch.2008.11.005

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10 Pinjari, D.V., Pandit, A.B.

Cavitation milling of natural cellulose to nanofibrils

(2010) *Ultrasonics Sonochemistry*, 17 (5), pp. 845-852. Cited 111 times.
www.elsevier.com/inca/publications/store/5/2/5/4/5/1
doi: 10.1016/j.ultsonch.2010.03.005

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11 Hill, M.R., Russell, J.J., Lamb, R.N.

High-quality $Zn_xMg_{1-x}O$ thin films deposited from a single molecular source. Intimate mixing as a means to improved film properties

(2008) *Chemistry of Materials*, 20 (7), pp. 2461-2467. Cited 16 times.
doi: 10.1021/cm702423t

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Optical property enhancement of silica-modified polyaniline grown on glass substrate via incorporation of zinc sulfide into the polymer matrix

Melchor J. Potestas, Arnold C. Alguno, Reynaldo M. Vequizo, Bianca Rae B. Sambo, and Majvell Kay G. Odarve

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Keywords: Chemical bath deposition, nanocomposite, optical property, PAni emeraldine, silica-modified polyaniline, zinc sulfide.

Abstract. Growth of zinc sulfide (ZnS) nanostructures on silica modified-polyaniline (SM-PAni) with polymerization time-dependent was prepared using chemical bath deposition (CBD) technique. The grown samples were characterized by scanning electron microscopy (SEM), fourier transform infrared (FTIR) spectroscopy, and ultraviolet-visible (UV-Vis) spectroscopy. SEM images revealed some voids in the nanocomposites. The average diameter of the grown ZnS nanospheres did not significantly change by changing the growth time of the polyaniline. FTIR spectra and UV-Vis absorption spectra revealed the partial transformation of emeraldine salt polyaniline into emeraldine base PAni due to the deprotonation triggered during CBD for the synthesis of ZnS nanostructures. Furthermore, UV-Vis absorption spectra reveal synergistic effect of the absorption bands of both polyaniline and ZnS nanostructures. This synergistic effect results to the enhancement in the optical property of the fabricated nanocomposite which is an essential property in optoelectronics and solar cell application.

Introduction

Over the past two decades, significant scientific development and technological interest has been devoted in the study of organic and inorganic nanocomposites. The growth of inorganic nanoparticles into the polymer matrix can provide thermally stable, high performance, and novel materials for optoelectronics and sensor applications [1-2]. As a result of the advancement of nanotechnology, inorganic-organic nanocomposite materials have been designed and fabricated with unique chemical, physical, and optical properties for specific application.

Polyaniline (PAni) is one of the most studied forms among conducting polymers due to its unique properties and easy fabrication method [1-2]. The emeraldine salt oxidation state of PAni is the most investigated form due its conductivity, environmental stability, and tunable morphology for its absorption capability [3-4]. The synthesis of this polymer can produce a variety of "one-dimensional" morphologies, like rectangular structures [5], nanotubes [6], nanofibers[1, 7], micromats [7],or even nanodisks [7], which made them unique materials for specific device application. A standard way to tune and improve the morphology of PAni nanostructures is by the introduction of a suitable steric stabilizer [8]. Smoother and more uniform surface will be achieved due to the non-formation of PAni agglomerates upon the introduction of steric stabilizer [9]. It is known that PAni has high absorption spectra along the UV region and a part of the visible region of the electromagnetic spectrum [10]. Improving the morphology of PAni may affect the optical property of the polymer which is an essential factor in optoelectronics applications.

Another promising material that has been widely studied in the field of optoelectronics application is Zinc Sulfide (ZnS) [11-13]. ZnS belongs to II-VI group compound semiconductors and has a wide energy band gap [14, 15]. Several studies present different techniques in its fabrication which leads to its different morphologies [15-16]. One noble way in preparing ZnS nanostructures is by chemical bath deposition (CBD). In this method, nanostructures are deposited on substrate immersed in a solution containing metal ions source, hydroxides, and sulfide ions [17]. The

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Optical, Structural and Morphological Properties of Ternary Thin Film Blend of P3HT:PCBM:ZnO Nanoparticles

Ayi Bahtiar[1, a *], Siti Halimah Tusaddiah[1,b], Wendy Paramandhita S. Mustikasari[1, c], Lusi Safriani[1, d], Mariah Kartawidjaja[1, e], Kei Kanazawa[2,f], Ippei Enokida[2,g], Yukio Furukawa[2,h] and Isao Watanabe[3,i]

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Abstract. Ternary blend film of conjugated polymer, fullerene and inorganic nanoparticles has intensively studied as active material for high power conversion efficiency (PCE) of hybrid solar cells. The mixing of two electron acceptor materials consisting of organic fullerene and inorganic nanoparticles with electron donor conjugated polymer is strongly believed can improve the PCE of solar cells. This ternary blend will increase exciton dissociation efficiency due to the increase of interface area between donor and acceptor materials where exciton dissociation takes place. We have studied optical, structural and morphological properties of ternary thin films containing blend of conjugated polymer poly(3-hexylthiophene (P3HT):fullerene derivative PCBM:Zinc oxide nanoparticles (ZnO-NPs) by measuring their optical absorption, crystal structure and thin film surface morphology. The aim of this research is to ensure that the P3HT, PCBM and ZnO-NP are well mixed both in solutions and in thin films. The ZnO-NP was prepared by using sol-gel method. The average particle size of ZnO-NP is 40 nm as derived from UV-Vis spectrum and confirmed with TEM image. Thin blend films were prepared by using spin-coating method. The UV-Vis spectra show that conjugated polymer P3HT, PCBM and ZnO-NP are well mixed both in solutions and in thin films. Moreover, the well mixed of these three materials are also verified by the XRD pattern and SEM image of the ternary blend film.

Introduction

Hybrid organic and inorganic solar cells have been extensively studied for achieving high power conversion efficiency (PCE) solar cells. Conjugated polymer poly(3-hexylthiophene) or P3HT is commonly used as organic material in hybrid solar cells due to its well known semiconducting properties and easily to dissolve in common organic solvent, therefore, it offers low-cost thin film processing such as spin-coating, inkjet-printing and roll-to-roll printing. On the other hand, zinc oxide (ZnO) is widely used as inorganic material in hybrid solar cells because it can be synthesized into nanoparticles by using low-temperature chemical methods such as sol-gel method. Moreover, ZnO is non-toxic, its electron mobility is higher than that of other metal oxide like titanium dioxide (TiO_2) and it can be formed in a large variety of nanostructures [1]. However, ZnO nanoparticle (ZnO-NP) is easily agglomerate to form larger size which reduces exciton dissociation at conjugated