https://doi.org/10.33263/Proceedings11.00540055

ISSN: 2668-6384 https://conferenceproceedings.international

Proceedings International

Proceedings, Abstract

Volume 1, Issue 1, Pages 0054-0055
2019

Received: 01.10.2019
Accepted: 10.10.2019
Published: 15.10.2019

SEM investigations of Fe-doped ZnO powders

R. Trusca [1], M. Cernea [2], M. Enculescu [2], A.I, Nicoara [1], T. Popescu [2], C. Trisca-Rusu [3]

[1] Politehnica University of Bucharest, 1-7 Gh, Polizu, 011061, Bucharest, Romania
[2] National Institute of Materials Physics, Atomistilor 405A, P.O. Box MG-7, Bucharest-Magurele, 077125, Romania
[3] National Institute of Research and Development for Microtechnology, Erou Iancu Nicolae 126A, Voluntari, 077190
* Correspondence: truscaroxana@yahoo.com; Scopus ID: 24529356300

Zinc oxide (ZnO) is a semiconductor with a wide band gap (Eg=3.37 eV) and numerous applications as photo- catalysts, antibacterial agent, solar cells, gas sensors, etc [1, 2]. However, wide-band gap semiconductors are only activated under ultraviolet (UV) light irradiation, which limits their practical applications. The doping of various transition-metal cations or anions into wide-band gap semiconductors has been extensively studied to increase the visible-light absorption of these photocatalysts. In order to develop ZnO visible-light photocatalyst activity, ZnO was doped with Fe3+ because bulk-doped Fe(III) ions acts as visible-light absorbers. In the present study, we prepared ZnO doped with 0-3 at.% Fe by hydrothermal method, in the absence and/or presence of a surfactant (CTAB) and, we investigated the as-obtained powders by X-ray diffraction, scanning electron microscope (SEM) and the photocatalytic tests on methylene blue (MB) in both UV and visible spectral regions. As results, we found that the morphologic and photocatalytic properties of the two series of samples - iron doped ZnO with and without surfactant are in opposition. The photocatalytic activity in both UV and visible spectral region for the samples prepared without surfactant decreases as the iron content in samples increases while, an increase of the photocatalytic properties can be observed in the case of samples prepared with surfactant as the iron content increases, in agreement with UV-vis reflection measurements. Our results highlight the beneficial role of iron and surfactant on the photocatalytic properties of ZnO [3,4].

Keywords: *SEM, Fe-doped, ZnO powder, photocatalytic properties.*

Funding

SEM analyses of the samples were facilitated by EU-funding grant POSCCE-A2-O2.2.1-2013-1/ Priority direction 2, Project No.638/12.03.2014, cod SMIS-CSNR 48652.

Acknowledgments

Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

Cite This Work: Trusca, R., Cernea, M.; Enculescu, M.; Nicoara, A.I.; Popescu, T.; Trisca-Rusu, C. SEM investigation of Fe-doped ZnO powders. Proceedings Int **2019**, 1, 0054-0055. https://doi.org/10.33263/Proceedings11.00540055

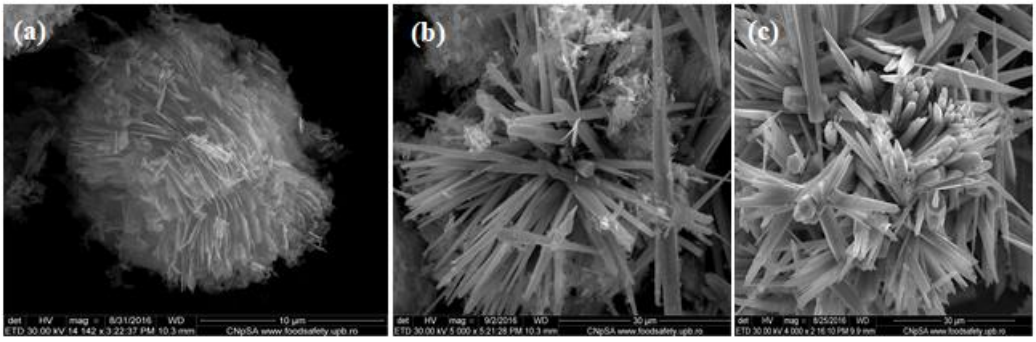

Figure 1. SEM images with various magnifications of A0 (a), A1 (b) and A3 (c) powders (without surfactant) dried at 200 °C, 2h in air.

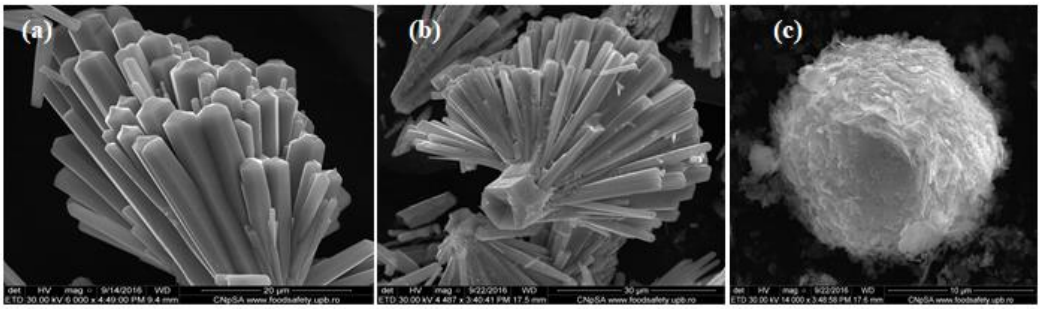

Figure 2. SEM images with various magnifications of A0,s (a), A1,s (b) and A3,s (c)-Ref.[3] powders (with surfactant) dried at 200 °C, 2h in air.

References

1. Mang, A.; Reimann, K.; Rubenacke, S. Band gaps, crystal field splitting, spin-orbit coupling, and exciton binding energies in ZnO under hydrostatic pressure. *Solid State Commun.* **1995**, *94*, 251–254, https://doi.org/10.1016/0038-1098(95)00054-2

2. Yin, H.; Coleman, V.A.; Casey, P.S.; Angel, B.; Catchpoole, H.J.; Waddington, L.; McCall, M.J. A comparative study of the physical and chemical properties of nanosized ZnO particles from multiple batches of three commercial products. *J.Nanoparticle Res.* **2015**, *17,* 96–114, https://doi.org/10.1007/s11051-014-2851-y.

3. Diamandescu, L.; Cernea, M.; Trusca, R.; Enculescu, M.; Tanase, L.; Baibarac, M.; Feder, M.; Nicoara, A.I.; Popescu, T. Effects of a surfactant on the morphology and photocatalytic properties of polycrystalline Fe-doped ZnO powders. *J. Phys. Chem. Solids*. **2018**, *121*, 319-328, https://doi.org/10.1016/j.jpcs.2018.05.041.

4. Mihalache, M.; Cernea, M.; Pasuk, I. Relationship between ferromagnetism and, structure and morphology in un-doped ZnO and Fe-doped ZnO powders prepared by hydrothermal route. *Curr. Appl. Physics*. **2017**, *17*, 1127-1135, https://doi.org/10.1016/j.cap.2017.03.020.