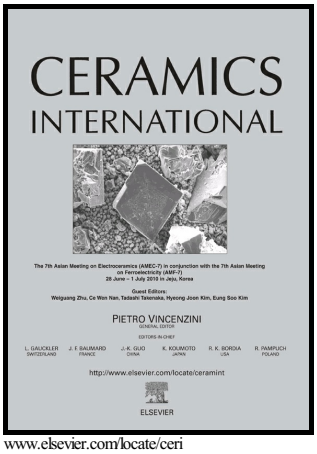

www.elsevier.com/locate/ceri

Rapid Synthesis and Photocatalytic Activity of ZnO Nanowires Obtained Through Microwave-Assisted Thermal Decomposition

F. Solis-Pomar, A. Jaramillo, C. Medina, D. Rojas, A.C. Mera, M.F. Meléndrez, E. Pérez -Tijerina

PII: S0272-8842(16)31391-8
DOI: http://dx.doi.org/10.1016/j.ceramint.2016.08.084
Reference: CERI13536

To appear in: *Ceramics International*

Received date: 29 June 2016
Revised date: 25 July 2016
Accepted date: 13 August 2016

Cite this article as: F. Solis-Pomar, A. Jaramillo, C. Medina, D. Rojas, A.C. Mera, M.F. Meléndrez and E. Pérez -Tijerina, Rapid Synthesis and Photocatalytic Activity of ZnO Nanowires Obtained Through Microwave Assisted Thermal Decomposition, *Ceramics International* http://dx.doi.org/10.1016/j.ceramint.2016.08.084

Rapid Synthesis and Photocatalytic Activity of ZnO Nanowires Obtained Through Microwave-Assisted Thermal Decomposition

F. Solis-Pomar[1], A. Jaramillo[2], C. Medina[3], D. Rojas[2], A. C. Mera[4], M.F. Meléndrez[2*], E. Pérez -Tijerina[1]

[1]*Facultad de Ciencias Físico-Matemáticas, Universidad Autónoma de Nuevo León, San Nicolás de los Garza, Nuevo León 66451, México*

[2]*Advanced Nanocomposites Research Group (GINA). Hybrid Materials Laboratory (HML). Department of Materials Engineering (DIMAT), Faculty of Engineering, University of Concepcion, 270 Edmundo Larenas, Box 160-C, Concepcion, Chile 4070409.*

[3]*Department of Mechanic Engineering (DIM), Faculty of Engineering, University of Concepcion, 219 Edmundo Larenas, Box 160-C, Concepcion, Chile 4070409*

[4]*Multidisciplinary Research Institute in Science and Technology, Ineergias, University of La Serena,* Benavente 980*, La Serena, Chile*

[*]*Corresponding autor. UdeC, Edmundo Larenas 270, Concepción, Chile. Phone: +5641-2203187, Fax: +56-41-2203391. E-mail: m.melendrez@udec.cl*

Abstract

This work reports a new method for large scale production of ZnO nanowires (ZnO-NWs) by microwave assisted thermal decomposition (MATD). This method is simple, economical and reproducible; in addition, the production of material exceeds 95% without using preferential growth precursors. The reaction occurs in only 3 minutes with minimal energy expenditure. ZnO-NWs produced at 1200 W had diameters ranging between 20 and 70 nm and lengths that varied between 1 and 15 μm, were totally crystalline and showed preferential growth in the [001] direction. Using XRD and HRTEM, it was determined that ZnO presented a hexagonal, wurtzite structure. The relationship between graphite and ZnO, the power of the reaction system and the reactor humidity each played an important role in this method and need to be properly controlled to optimize the production of nanowires. The reactor used allowed for the separation of the reaction products; for that reason, the ZnO-NWs produced had a high degree of purity, as determined by XRD. The photocatalytic activity of ZnO-NWs in methyl orange (MO) decreased as the pH increased; this behavior is common in ZnO because basic pH increased the interaction between the MO and ZnO. The synthesis process, growth mechanisms and photocatalytic activity of ZnO-NWs are discussed in this work.

Keywords: ZnO *Nanowires, Photocatalytic, Nanostructures, Microwave.*

1. Introduction.