15th International Conference on the Physics of Non-Ideal Plasmas Almaty, August 30- September 4, 2015

PNP

Book of Abstracts

15th International Conference on the Physics of Non-Ideal Plasmas Almaty, August 30 - September 4, 2015

Al-Farabi Kazakh National University

Institute of Experimental and Theoretical Physics

National Laboratory of Nanotechnology

TNS-INTEC

Insitute of Applied Sciences and Information Technologies

IASIT

Laboratory of Engineering Profile

PL21

Plasma-assisted Functionalization of ZnO Nanoparticles and Production of Nanocrystalline ZnO Structures

I.I. Filatova, N.I. Chubrik, V.A. Lyushkevich
B.I. Stepanov Institute of Physics, NAS of Belarus, 70 Nezavisimosti Ave., Minsk, i.filatova@dragon.bas-net.by

N.A. Savastenko
International Sakharov Environmental University, 23 Dolgobrodskaya Street, Minsk, 220070, Belarus

Ramazanov T.S., M. Gabdullin, Dosbolayev M.K., Utegenov A.
Al Farabi KazNU, NNLOT, 71 Al Farabi Almaty av., Almaty, 050040, Kazakhstan

Zinc oxide (ZnO), owing to its unique physical and chemical properties, variety of nanometric ZnO structures can be considered as a multifunctional material with potential large-scale technological applications. In the recent years many researchers carrying out numerous studies to find methods of production or modifying the surface of the ZnO compounds for their new possible applications.

In this work, the experiments on the production of nanocrystalline structures of zinc oxide by thermal method in high-frequency gas discharge were done and a method is proposed for ZnO powders modification using plasma treatment in order to improve their photocatalytic activity.

The synthesis process was carried out in the plasma of inert gas mixtures. At the heating of the evaporator the molecule of the produced zinc injected into the plasma volume and agglomerated the nanoparticles. In the plasma the negatively charged zinc nanoparticles (dusty plasma) are deposited on a silicon substrate, forming a parallel array of the oriented nanorods of ZnO.

Modification of ZnO powders was conducted the air plasma of capacitively coupled RF discharge at a pressure of 60 Pa. Particles were injected into the plasma by means of a piezoelectric radiator which was placed on the lower grounded electrode. Dust particles levitated above the lower electrode that provided a uniform treatment of the material. A method has been proposed for the evaluation of the kinetic of Methyl Orange (MO) photodegradation over ZnO. The experimental results proved that the plasma modified ZnO powders presented promising photocatalytic activity toward the dye photodegradation (fig. 1).

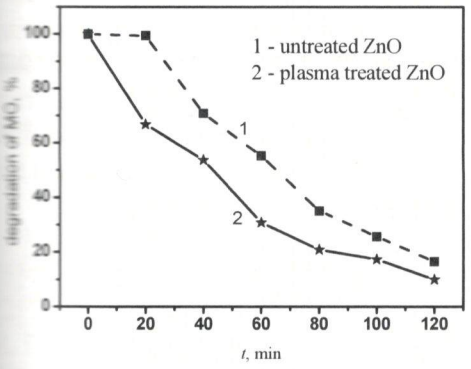

Fig. 1. Effect of ZnO nanoparticles on photocatalytic degradation of MO

This work is partly supported by State Committee on Science and Technology of the Republic of Belarus and the BRFFR under the grant No Ф14КА3-004.