Complex nanostructures of ZnO: growth and properties

Ahmad Umar, Y.K. Park and Y.B. Hahn*

School of Semiconductor and Chemical Engineering, 
BK21 Centre for Future Energy Materials and Devices, 
Chonbuk National University, 
664-14, Duckjin-Dong 1-Ga, 
Chonju, 561-756, Republic of Korea 
E-mail: ahmadumar@chonbuk.ac.kr 
E-mail: ykpark67@hotmail.com 
E-mail: ybhahn@chonbuk.ac.kr 
*Corresponding author

A. Al-Hajry

Department of Physics, College of Science, 
Najran University, 
P.O. Box 1988, Najran, Saudi Arabia 
E-mail: ahajry@gmail.com

Abstract: Variety of complex ZnO nanostructures such as flower-shaped structures, hierarchical and star-shaped nanostructures have been grown by the novel cyclic feeding chemical vapour deposition (CFCVD) process on various substrates at low-temperatures of 475°C to 550°C. Metal organic source, diethyl zinc (DEZn) and oxygen gas was used as source materials for zinc and oxygen, respectively for the growth of ZnO nanostructures synthesised by CFCVD process. The selected area electron diffraction (SAED) pattern of the flower-shaped structures confirmed that the grown products are single-crystalline ZnO. In addition to the ZnO nanostructures grown CFCVD process, comb-like ZnO structures were also synthesised, in a high density, via simple thermal evaporation process by using metallic zinc powder and oxygen as source materials for zinc and oxygen, respectively. The X-ray diffraction pattern of the synthesised comb-like structures exhibited that these structures are possessing single-crystallinity and wurtzite hexagonal phase of ZnO.

Keywords: zinc oxide; ZnO; complex nanostructures; II-VI semiconductor; cyclic feeding chemical vapour deposition; CFCVD; thermal evaporation.


Biographical notes: Ahmad Umar is a Research Scientist in the School of Semiconductor and Chemical Engineering, Chonbuk National University, South Korea. His current research interest is the synthesis, characterisations and applications (chemical, bio- and gas sensors, and renewable energy applications) of metal oxide nanostructures, especially ZnO, CuO and NiO nanostructures.