Controlled growth of ZnO micro- and nanorod arrays by wet chemical method

Yong-Jin Kim[1], Chul-Ho Lee[1], Young Joon Hong[1], Gyu-Chul Yi[1]*, Sung Soo Kim[1], Hyeonsik Cheong[2]

[1]National CRI center for semiconductor Nanorods and Department of Environmental Science and Engineering, Pohang University of Science and Technology (POSTECH), Pohang, Gyeongbuk 790-784, Korea, [2]Department of Physics, Sogang University, Seoul 121-742, Korea

* E-mail : gcyi@postech.ac.kr

Recently, one-dimensional nanostructures have become considered as an important fundamentalbuilding block for electronics, photonics and chemical sensor due to their physical, chemical property. However, achieving the ability to control the position, structure and the morphology of materials at nanometer scale is the prerequisite for fabricating micro-and nanoscale devices. Until now, many researchers have concentrated on contriving the process to grow nanowires with controlling the position, structure and morphology through vapor-liquid-solid (VLS) growth method and selective-area metalorganic vapor-phase epitaxy (SA-MOVPE). In VLS nanowire growth, metal catalysts not only play an important role in forming liquid alloy droplets for deposition but also assist to fabricate nanowires at specific position. However, during growth, the catalyst might be incorporated into nanowires and generate unintentional defect levels. By using SA-MOVPE, onthe other hands, nanowires could be selectively grown only on open area not the masked area of substrates without help of metal catalysts at specific growth condition. These methods, however, require relatively expensive equipments to maintain high growth temperature and high vacuum level. Compared to these methods, wet chemical process has several advantages such as relative low growth temperature as well as large area growth, no need for use of metal catalysts and utilizing various substrates including glass and polymer. Here, we report on the selective growth of ZnO micro- and nanorod arrays through the wet chemical method. Moreover, through this method, ZnO micro- and nanorods were separately grown at specific sites with controlling diameter and inter-distance of ZnO nanorods.