Atmosphere Effect on Single Crystal Zinc Oxide Nanowires Growth

Seu Yi Li (李思毅)\textsuperscript{1}, Pang Lin (林鹏)\textsuperscript{1}, Chia Ying Lee (李佳颖)\textsuperscript{2}, and Tseung Yuen Tseng (曾俊元)\textsuperscript{2, a}

\textsuperscript{1}Institute and Department of Materials Science and Engineering, National Chiao Tung University, Hsinchu, 300, Taiwan.
\textsuperscript{2}Institute and Department of Electronics Engineering, National Chiao Tung University, Hsinchu, 300, Taiwan.
\textsuperscript{a}Tseng@cc.nctu.edu.tw

One-dimensional (1-D) nanostructures, for example, CNTs, metal oxide nanobelts (ribbons), and nanowires of metals, oxides, and semiconductors, have drawn much attention because of their interesting growth mechanism, physical property, and lots of application in the electronic and optical nanodevices. Recently, much works have been performed with the unique characteristics of semiconductor nanowires. Optical explorations of epitaxially grown nanowires have focused on the giant emission in photoluminescence characteristics. In the decade, lots of reports have shown that ZnO nanowires exhibit ultraviolet (UV) laser emission, which can be used in luminescent device applications. A variety of methods such as the two step vapor-liquid-solid (VLS) growth process\textsuperscript{1}, laser-assisted catalytic growth (LCG) method\textsuperscript{2}, chemical vapor deposition (CVD)\textsuperscript{3}, template\textsuperscript{4} and other methods have been employed to synthesize nanowires of different materials.

In the present study, single crystal zinc oxide (ZnO) nanowires were prepared by using enhanced two-step vapor-liquid-solid (VLS) growth mechanism. The ZnO nanowire grown with N\textsubscript{2}, not only has smaller the diameter of about ~30 nm but also exhibits a higher growth rate and larger number of density of nanowires per unit area than those grown with Ar. The photoluminescence measurements show that the ZnO nanowires grown with N\textsubscript{2} have a stronger ultraviolet emission than those grown with Ar.