

**[N-16]**

## **Zinc oxide nanowire growth on various substrates using VLS mechanism and thermal chemical vapor deposition**

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One-dimensional nanometer-sized structures such as nanowires and nanotubes have attracted much more attention in a respect of the dependance of their properties on the material dimensions and their application to nanodevices. In this research, we have grown zinc oxide nanowires on silicon, sapphire, and gallium nitride substrates by thermal chemical vapor deposition(CVD) and investigated their optical and structural properties, using scanning electron microscopy(SEM), transmission electron microscopy (TEM), X-ray diffraction(XRD), and photoluminescence(PL) spectroscopy. The catalyst metal films are deposited by pulsed laser deposition(PLD) technique under a pressure of  $10^{-6}$ Torr. In growth, the metal thin film was broken upto nanoparticles. We used carbothermal reduction to make zinc and oxygen vapor easily. And catalyst metal particles and source gases were reacted in 900°C or 950°C. In order to observe the orientation and alignment of zinc oxide nanowires, we used the SEM. SEM images show that the growth direction of zinc oxide nanowire depends on substrates due to the difference of substrate crystal structure and lattice mismatch with zinc oxide. Especially, gallium nitride substrate is good for aligning zinc oxide nanowires. The size of zinc oxide nanowires is 50nm in diameter and a few micrometer in length. XRD pattern shows that zinc oxide is wurtzite structure. And PL analysis shows strong 379nm emission with full width at half maximum(FWHM) of 52.09 meV at excitation wavelength of 325nm and excitation power of 20mW.