

Time-Dependant Growth and Properties of Well-Aligned ZnO Nanowires Grown by Low-Temperature Solution Process

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Time-dependant growth of well-aligned ZnO nanowires were done via simple solution process by using zinc nitrate hexahydrate and hexamethylene-tetramine on ZnO/glass substrates at low-temperature of $\sim 90^{\circ}\text{C}$. The morphological observations by FESEM revealed that the nanowires are highly aligned and grown in high-density over the large area of the substrate surface. The detailed structural characterizations confirmed that the grown nanowires are single-crystalline with the wurtzite hexagonal phase and preferentially grown along the [0001] direction. To check the time on the growth of ZnO nanowires, various time dependant experiments, by keeping all other reaction parameters constant, were performed with consecutive intervals of 3 hrs in each reaction. It was observed that with increasing the reaction time, the lengths and diameters of the grown nanowires increases significantly. The experimental results demonstrated that by controlling the reaction time, the length, diameters, and transparency of the ZnO nanowires can be controlled. Our approach to grow desirable length good-quality ZnO nanowires put a further step to use as-grown ZnO nanowires for various highly efficient ZnO-based nanodevices in near future.