

ZnO Nanorod arrays on p-Si and their applications for Light-Emitting Diodes

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Well-aligned n-ZnO nanorods arrays were synthesized in a high density on n-ZnO/p-Si substrate via low-temperature aqueous solution process at ~ 75 °C by using zinc nitrate and hexamethylenetetramine (HMTA). The detailed structural characterizations revealed that the as-synthesized nanorod arrays were single crystalline, with a hexagonal phase, and grown along the [0001] direction in preference. The room-temperature photoluminescence (PL) spectra showed a strong ultraviolet emission confirming that the as-grown nanorod arrays have good optical properties. For application point of view, the heterojunction devices have been fabricated by using n-ZnO nanorods/p-Si assembly and tested at different temperatures over the range of 25 ~ 160 °C. The fabricated device exhibited a low turn-on voltage and leakage current of ~ 0.5 V and $\sim 10^{-9}$ A, respectively. The presented approach by using low-temperature solution grown n-ZnO nanorod arrays on ZnO/Si substrate can be useful for the fabrication of nanoscale optoelectronic devices in future.