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Direct growth of vertically aligned long ZnO nanowires on FTO substrates and their application for dye sensitized solar cells LIYOU LU, JIAJUN CHEN, WENYONG WANG, Department of Physics and Astronomy, University of Wyoming — In this research we report a direct growth of vertically aligned ZnO nanowires on fluorine-doped-tin-oxide (FTO) coated substrates for dye sensitized solar cell (DSSC) applications. ZnO nanowires with length of more than 30 μm were synthesized using a fine-tuned chemical vapor deposition method at temperatures as low as 550 $^{\circ}\text{C}$. The nanowires grew along the [0001] direction and exhibited a needle-like shape with a wurtzite single crystal structure. Compared to the ZnO nanowires fabricated by solution based methods, the nanowires synthesized in this study have much longer length, thus could increase the amount of dye loading and improve DSSC performance. Furthermore, since the nanowires were directly synthesized on FTO substrates, DSSCs could be fabricated using the as-grown nanowires without the usual wire transfer processing that caused nanowire breaking and created additional transport barriers and recombination possibilities for photo-generated carriers. DSSCs fabricated in this study showed attractive performance with short-circuit current density of 5.1 mA/cm^2 and power conversion efficiency of 1.66%. Dependence of the DSSC performance on nanowire length and annealing processing was also examined in this research.

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