

## One-dimensional nanoarrays for solar cells

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### Abstract

Various kinds of modifying methods towards ZnO and TiO<sub>2</sub> one-dimensional nanostructures such as nanorods and nanotubes have been carried out for their applications in Dye-sensitized solar cell (DSSC), perovskite solar cell (PSC) and photo detectors (PD). Core-sheath ZnO/CdTe and double-sheath ZnO/CdSe/CdTe nanocable arrays as effective photoanode have been developed for solar cells, which resulted in a saturated current as high as 14.3 mA/cm<sup>2</sup>. Large area free-standing highly ordered TiO<sub>2</sub> nanotube arrays on the fluorine-doped tin oxide (FTO) conductive glass substrates have been successfully obtained to serve as photo-anodes of DSSCs. The certified photovoltaic conversion efficiency of TiO<sub>2</sub> nanoarrays based DSSCs is up to 10.3% by using N719 as Dye and I<sup>-</sup>/I<sub>3</sub><sup>-</sup> as electrolyte. Perovskite solar cell with efficiency of up to 18.6% based on TiO<sub>2</sub> nanorod arrays is also presented. Self-powered broadband photodetectors based on CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3</sub>/ZnO nanorod arrays heterostructure have been achieved with high detectivity of  $3.56 \times 10^{14}$  cm Hz<sup>1/2</sup> W<sup>-1</sup> and high responsivity of 24.3 A W<sup>-1</sup>.

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