

Accepted Manuscript

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PII: S0040-6090(17)30643-0
DOI: doi: [10.1016/j.tsf.2017.08.044](https://doi.org/10.1016/j.tsf.2017.08.044)
Reference: TSF 36186

To appear in: *Thin Solid Films*

Received date: 10 March 2017
Revised date: 23 August 2017
Accepted date: 26 August 2017

Please cite this article as: Yi-Yi Liu, Yi-Lin Wang, Xin-Yu Ye, Xiao-Dong Qiao, Qiu-Ping Luo, Bing-Xin Lei, Wei Sun, Zhen-Fan Sun , Ultra-long hierarchical bud-like branched TiO₂ nanowire arrays for dye-sensitized solar cells, *Thin Solid Films* (2017), doi: [10.1016/j.tsf.2017.08.044](https://doi.org/10.1016/j.tsf.2017.08.044)

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Ultra-long hierarchical bud-like branched TiO₂ nanowire arrays for dye-sensitized solar cells

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Abstract: The ultra-long hierarchical bud-like branched TiO₂ nanowire arrays on fluorine-doped tin oxide glass substrate have been prepared via a two-step solution route, which involves the growth of the anatase TiO₂ nanowires with the length of 48 μm on fluorine-doped tin oxide glass substrate, followed by a secondary growth of the rutile TiO₂ nanorods on the as-grown TiO₂ nanowires backbone. The dye-sensitized solar cell based on the hierarchical bud-like branched TiO₂ nanowire arrays shows a power conversion efficiency of 6.00%, which is nearly 2.88 times as high as that of bare TiO₂ nanowire arrays because of the preferable nanostructure, which not only retains the efficient charge separation and transport properties of one-dimensional TiO₂ nanostructures, but also improves the amount of dye adsorption and light-scattering ability due to the branched structure.

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