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## Low-temperature-dependent growth of titanium dioxide nanorod arrays in an improved aqueous chemical growth method for photoelectrochemical ultraviolet sensing (Article)

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## Abstract

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The growth of titanium dioxide nanorod arrays (TNAs) in aqueous solutions containing titanium butoxide and hydrochloric acid can be controlled by regulating the temperature from 115 to 150 °C as an adjustable physical parameter. The transparent colloidal solution of titanates is clouded on the basic growth of TNAs when heated at a certain temperature using an improved aqueous chemical growth method in a clamped Schott bottle. The structural, optical and electrical properties of grown TNAs films were thoroughly investigated and discussed. The distinct and high-intensity peaks observed in the X-ray diffraction pattern and Raman spectra of the grown TNAs show the rutile phase with high crystal quality. The crystallite size, diameter size, and thickness of TNAs decrease with decreasing growth temperature. The prepared TNAs were used to detect 365 nm ultraviolet (UV) photon energy (750 μW/cm $^2$ ) in a photoelectrochemical cell structure with a maximum photocurrent of 26.31 μA and minimum photocurrent of 3.48 μA recorded for TNAs grown at 150 °C and 115 °C, respectively. The size, structural properties, charge transfer resistance, and electron lifetime play a key role in determining the UV sensing characteristics of the TNAs. Results show that TNAs are very promising in fabricating a UV sensor with a high response at 0 V bias even at a low growth temperature of 115 °C. © 2018, Springer Science+Business Media, LLC, part of Springer Nature.

## SciVal Topic Prominence

Topic: Photodetectors | Nanowires | ultraviolet photodetectors

Prominence percentile: 99.480

## Reaxys Database Information

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## Indexed keywords

Engineering controlled terms: Bottles | Charge transfer | Crystallite size | Electrochemistry | Growth temperature | Oxide minerals | Photoelectrochemical cells | Sols | Titanium dioxide

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Engineering uncontrolled terms: Aqueous chemical growth | Charge transfer resistance | Colloidal solutions | Crystal qualities | Low growth temperature | Optical and electrical properties | Photoelectrochemicals | Physical parameters

Engineering main heading: Nanorods

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