

Fabrication of vertically aligned TiO₂ nanorods using hydrothermal method as photo anodes for dye sensitized solar cells

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Abstract: Nowadays, different nanostructures of TiO₂ have been investigated in various applications. [1] Among them, 1D nanostructures such as nanorods (NRs), nanowires (NWs) and nanotubes (NTs) have been found to be better because they provide uni-directional path for charge transport. Also the length of the NRs/NWs/NTs influences the charge collection efficiency. Moreover the relatively large specific surface area and chemical stability allow 1D TiO₂ nanostructured materials to be widely used in photocatalysis, water splitting, solar cells, supercapacitors and various other devices. Many methods (hydrothermal, electrochemical anodization, vapor deposition, sol-gel, template-assisted, and electrospinning methods) have been developed to prepare 1D TiO₂ nanostructures with various morphologies [1].

In the present work, hydrothermal method has been used for the growth of vertically aligned and long TiO₂ NRs onto fluorine doped tin oxide (FTO) substrates [2-3]. In a typical synthesis process, titanium butoxide (TiB) was used a source to titanium and was hydrolyzed in acidic medium under vigorous stirring. Now, cleaned substrate (FTO) was placed horizontally with its conducting side upwards in 40 ml teflon container. The resulting clear solution was poured into the container and was placed inside the autoclave and sealed. The autoclave was kept inside of pre heated (200 °C) vacuum oven for 3 hours. A white color layer was formed on FTO substrate.

The morphology of TiO₂ NRs has been confirmed through atomic force microscopy (AFM). Spectroscopic measurements (UV-Vis, Raman and Photoluminescence spectroscopy) have been performed on TiO₂ NRs to study their optical properties. Further, 1D TiO₂ photoanode has been used to fabricate DSSC and its photovoltaic performance has been compared with standard DSSCs



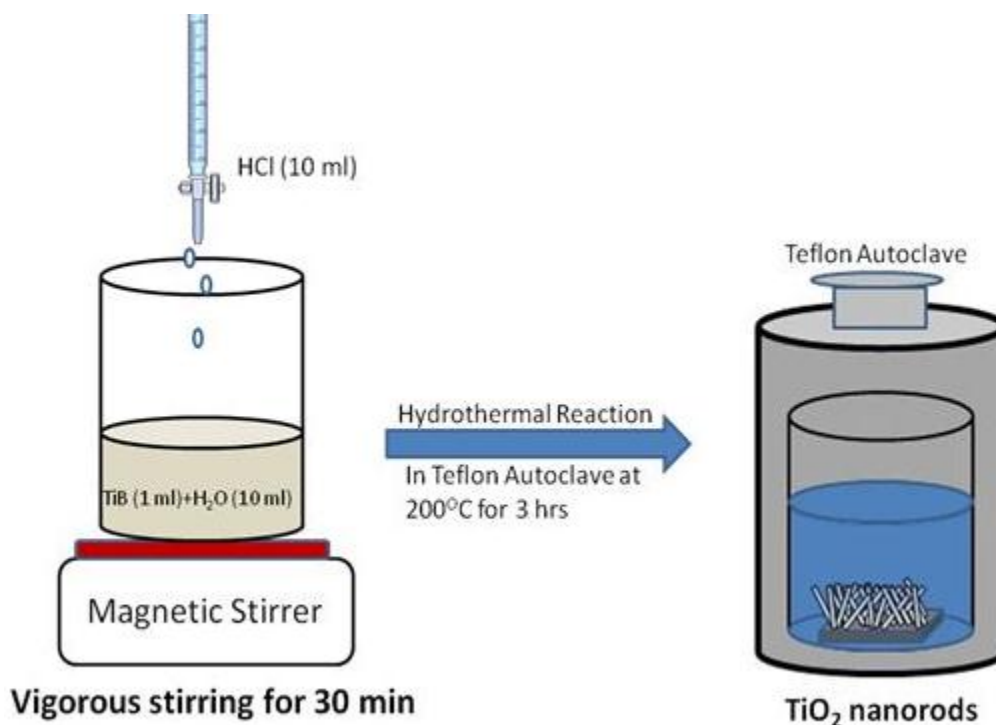


Figure 1: (a) Schematic representation of Hydrothermal Process;
(b) Teflon Autoclave used in the process.

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