|  |  |  |  |
| --- | --- | --- | --- |
| Title | Effect of tungsten doping on the microstructure, optical and photocatalytic activity of titanium dioxide thin films deposited by spray pyrolysis | | |
| Author(s) Name | Tusar Saha, Jiban Podder, Md Rakibul Islam, Hari Narayan Das | | |
| Contact Email(s) | [tusar.justphy@gmail.com](mailto:tusar.justphy@gmail.com), [jpodder@phy.buet.ac.bd](mailto:jpodder@phy.buet.ac.bd) | | |
| Published Journal Name | Optical Materials | | |
| Type of Publication | Article | | |
| Volume | 133 | Issue |  |
| Publisher | Elsevier | | |
| Publication Date | 10 October 2022 | | |
| ISSN | 0925-3467 | | |
| DOI | <https://doi.org/10.1016/j.optmat.2022.113065> | | |
| URL |  | | |
| Other Related Info. |  | | |
|  | | | |

|  |  |
| --- | --- |
| Abstract |  |
| In this study, pristine titanium dioxide (TiO2) and [tungsten](https://www.sciencedirect.com/topics/materials-science/tungsten) (W) doped TiO2 (W: TiO2) [thin films](https://www.sciencedirect.com/topics/materials-science/thin-films) with concentrations of 2, 4, 6 and 8 at. % has been deposited on a soda lime glass substrate at 450 °C using a simple [spray pyrolysis](https://www.sciencedirect.com/topics/materials-science/spray-pyrolysis) (SP) technique. The [surface morphology](https://www.sciencedirect.com/topics/materials-science/surface-morphology) of TiO2 and W: TiO2 [thin films](https://www.sciencedirect.com/topics/materials-science/thin-films) showed a mixed phases of particle and reticulated fiber nature as observed by the [field emission scanning electron microscopy](https://www.sciencedirect.com/topics/materials-science/field-emission-scanning-electron-microscopy) (FESEM). The average size of the particles was found to be 1.094 μm and the thickness of the reticulated fiber varies between 0.230 and 0.651 μm. Energy dispersive X-ray (EDX) analysis demonstrate stoichiometric distribution of Ti, W, and O elements in the as-deposited films. Ultraviolet–visible (UV–Vis) spectroscopy was used to estimate the optical band gap of the thin films and was found to be decreased monotonically from 3.36 eV to 3.02 eV due to the incorporation of W into the TiO2 thin films. The effect of W-doping on the variation of edge potentials of the [conduction bands](https://www.sciencedirect.com/topics/physics-and-astronomy/conduction-band) (CB) and valence bands (VB) of the TiO2 thin films were studied. Furthermore, the effect of W-doping on the degradation of the methylene blue (MB) under UV-light illumination was studied. 6 at. % W: TiO2 thin films demonstrate the highest degradation efficiency (76%) among all the samples. This can be attributed to the reduction of electron-hole recombination due to reduced band gap together with production of adsorption sites at the cylindrical pores of the thin films. | |