**Fabrication of CdSe nanoparticles sensitized TiO2 nanotube arrays via pulse electrodeposition for photoelectrochemical application**

ABSTRACT

Solar energy is an alternative sustainable energy resource that can be harvested using photoelectrochemical cell comprised of inorganic sensitized nanostructured oxide semiconductor electrode. In this work, pulse electrodeposition was used to deposit CdSe onto titanium dioxide nanotube arrays (TiO2 NTAs). TiO2 NTAs are commonly used in the nanostructured photoelectrochemical cells due to their high surface area, fewer interfacial grain boundaries and excellent charge transfer between interfaces. Duty cycle of pulse electrodeposition played an important role in the formation of CdSe nanoparticles. A significant enhancement in the photoelectrochemical performance was observed for the heterostructure of CdSe/TiO2 NTAs. CdSe/TiO2 NTAs prepared at 50% duty cycle exhibited maximum photocurrent of 1.94 mA cm−2 and photoconversion efficiency of 1.18% which was 59 times higher than bare TiO2 NTAs. These results demonstrated that significant enhancement in the photoconversion efficiency could be obtained by incorporating CdSe as sensitizer into the TiO2 nanotube arrays via pulse electrodeposition technique.

**Keyword:** Solar energy; Nanelectrodeposition; Photoelectrochemical cell