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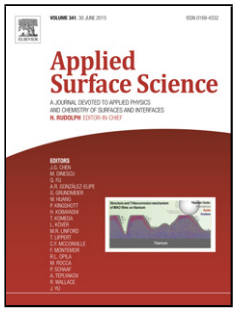

Title: Photoelectrocatalytic hydrogen generation and simultaneous degradation of organic pollutant *via* $CdSe/TiO_2$ nanotube arrays

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Photoelectrocatalytic hydrogen generation and simultaneous degradation of organic pollutant *via* $CdSe/TiO_2$ nanotube arrays

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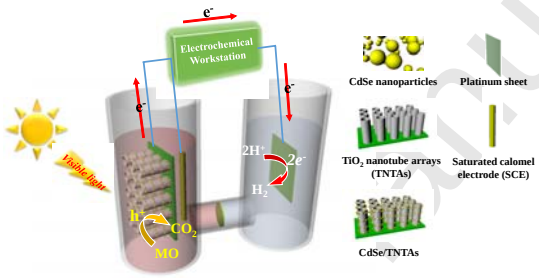
Graphical Abstract



A highly efficient $CdSe/TiO_2$ nanotube arrays photoanode was explored *via* the electrodeposition with ion-exchange method for photoelectrocatalytic hydrogen evolution and simultaneous degradation of organic pollutant under visible light irradiation.

Highlights:

1. CdSe nanoparticles enhanced TiO_2 nanotube arrays electrode was prepared by an electrodeposition with ion-exchange method.
2. CdSe nanoparticles were strongly bonded on the pore walls of TiO_2 nanotube arrays, with the formation of CdSe-TiO_2 heterojunctions.
3. Such $CdSe/TiO_2$ nanotubes arrays, acting as photoanode, exhibited high efficiency for both generation of hydrogen and degradation of MO in photoelectrocatalysis reaction system under visible-light irradiation.

ABSTRACT:

CdSe nanoparticles enhanced TiO_2 nanotube arrays electrodes (CdSe/TNTAs) were explored as the photoanode for driving the photoelectrocatalytic (PEC) generation of hydrogen and simultaneous degradation of organic pollutants in a PEC system. The evolution hydrogen and the simultaneous degradation of organic pollutants were performed in an electrolytic cell (three electrodes system) under visible-light ($\lambda > 400$ nm). Such $CdSe/TiO_2$ based PEC system exhibited both high efficiency of hydrogen