

Latest improvements in the photocatalytic behavior of TiO₂ nanotube aligned arrays

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TiO₂ has been the focus of enormous research activities during the last two decades. In the form of titania nanotube aligned arrays (TNA), the material is now a prominent candidate for the production of hydrogen from water through photo-catalysis. Aiming at the use of sunlight as the sole source of energy, great efforts have been done by the researchers to decrease the band-gap of TNAs while keeping the recombination process minimal. Here, we will present our latest discoveries regarding the improvement of the photo-catalytic properties of TNAs through the implementation of multiple doping or use of special quantum dot decorations. Multiple doping (three dopants) through a special one-step chemical route may result in a synergetic effect leading to the reduction of band-gap energy. Special novel quantum dot decorations may also lead to similar highly enhanced photo-catalytic behaviors which will be alluded to in the presentation.

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A sensitive assay using gold nanoparticles conjugated monoclonal antibody for detection of circulating schistosomal antigen

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Several hybridoma cell lines secreting monoclonal antibody against adult worm tegumental Schistosoma antigen were produced and preserved in liquid nitrogen. One MAb (6D/6F) was chosen for this study due to its high reactivity to schistosome antigens. Gold nanoparticles (AuNPs) were functionalized and conjugated with MAb. The study was conducted on serum samples of 116 subjects: 71 patients with *S. mansoni* eggs in their stools, 25 patients with other parasites and 20 negative healthy controls. Infected group were subdivided according to egg count in their stools into light infection, moderate and severe infection. Sandwich ELISA was performed using (AuNPs -MAb) for detection of circulating schistosomal antigen level (CSA) in serum samples of all groups and the results were compared with that after using conventional sandwich ELISA. Gold- MAb/ ELISA system could detect up to 10 ng/ml CSA compared to 85 ng/ml on using conventional ELISA and the optimal concentrations of AuNPs -MAb were found to be 12 folds less than that of MAb/ ELISA system. Sensitivity and specificity of sandwich ELISA using AuNPs-MAb were 100% & 97.8% compared to 87.3% & 93.38% respectively on using conventional ELISA system. The higher sensitivity and specificity of using AuNPs -MAb enabling detection of cases with light infection that were missed using conventional ELISA. Our data demonstrated that: Loading gold nanoparticles with MAb increases the sensitivity and specificity of sandwich ELISA for detection of CSA, thus active and light infections could be easily detected. This binding will decrease the amount of MAb consumed in the assay and lower the cost.

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