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Removal of methylene blue from aqueous solution by aniline and nanocomposites based on multi-walled carbon nanotubes with different size

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The colors are classified as complex toxic organic materials, which are considered as the most important pollutants from the textile wastewater. This study aimed to investigate the feasibility of multi-walled carbon nanotubes use as adsorbents for the adsorption of methylene blue from aqueous solutions. This experimental study was performed discontinuously and studied the effects of the different parameters including contact time, p^H, the initial concentration of the dye, and nanotubes dose on the dye removal of methylene blue. The maximum absorbance in the first 100 min was obtained 2 hrs. By increasing the adsorbent dose from 0.05 to 0.25 g on 100 gl^{-1} at the initial concentration, removal, random an for methylene blue solution 50 mg/mL, the dye removal efficiency was increased from 91.48% to 99.86% and 91.37% to99.83% and 90.87% to 99.73%. At the optimized p^H=6, optimal contact time 3 hrs, the dye removal efficiency was increased from 98.45% to 99.34% and 98.25% to 99.27% and 96.58 % to 99.10%, while the initial concentration of color was decreased from 5 to 1 mg/L. Due to the small size, high surface area, regulatory network and Cristal form of unique, high reactivity, and the remarkable function of multi-wall carbon nanotubes as adsorbents for the removal of organic pollutants from water solutions, the results showed that the multi-walled carbon nanotubes are effective adsorbents for the dye removal of methylene blue.

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Materials design of nano-structured oxide platforms for chemical sensing and biomedical applications

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Recent work in the author's laboratory has led to the development of surface modification techniques for the fabrication of nanostructures that are inexpensive, highly scalable and do not require use of state-of-the-art nano-lithography. One process creates nanofiber arrays of single crystal TiO_2 by gas phase (containing hydrogen) reaction called nanocarving. Our work on single crystal TiO_2 shows that on Au-catalyzed (001) surface, oriented nano-fibers can be grown with <001> and <110> alignments using H_2/N_2 heat treatment. H_2/N_2 heat treatment was also used to grow nanofibers on polycrystalline SnO_2 in regions of the sample coated with gold, showing directional growth on grains with crystal facets. We have also developed a process to create nanofibers of TiO_2 on Ti metal and Ti alloys via oxidation under a limited supply of oxygen. Lately, we have succeeded in converting the 1-D TiO_2 nano-fiber grown by thermal oxidation to nano-dendritic titanates by a hydrothermal treatment. The conversion of TiO_2 to barium titanate is a path to synthesizing materials in a different class of functionality because of their piezoelectric and ferroelectric responses. We developed yet another interesting nano-structure (nanoislands and nanbars) during thermal annealing of an oxide (GDC) on top of another oxide (YSZ) substrate that self-assembles along the softest elastic direction of the substrate. What is common about these structures is that they are fabricated without the use of lithographic techniques and involves simple processes such as gas-phase reactions and stress-driven process. Results of sensing and biomedical applications using these nano-structured platforms will be presented.

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