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# Surface Modification by Vanadium Pentoxide Turns Oxide Nanocrystals into Powerful Adsorbents of Methylene Blue

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## ABSTRACT

### *Hypothesis*

If nanocrystals of such semiconductor as SnO<sub>2</sub> and TiO<sub>2</sub>, which are not known as powerful adsorbents, have their surface modified by layer of V<sub>2</sub>O<sub>5</sub>, how will the adsorption properties be affected? Answering this question would provide a new set of surface properties to be designed by surface engineering of oxide nanocrystals.

### *Experiments*

SnO<sub>2</sub> and TiO<sub>2</sub> colloidal nanocrystals were prepared by coupling sol-gel and solvothermal synthesis. By co-processing with V chloroalkoxide and subsequent heat-treatment at 400-500 °C, surface deposition of V<sub>2</sub>O<sub>5</sub> layers was obtained. The methylene blue adsorption onto the prepared materials was tested and compared with the pure oxide supports. Cycling of the materials and analysis of the adsorption process was also investigated.

### *Findings*

The V-modified nanocrystals extracted ~ 80% methylene blue from 1.5 x 10<sup>-5</sup> M aqueous solution after 15 min only, contrarily to pure materials, which took up only 30% of the dye even after 120 min. Comparison with pure commercial V<sub>2</sub>O<sub>5</sub> showed that the peculiar adsorption properties were imparted

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