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Research Article

Visible Light Assisted Photocatalytic Degradation of Methylene Blue Dye and Mixture of Dyes Using ZrO₂-TiO₂ Nanocomposites

Author(s): [Radhakrishna S. Sutar](#), [Rani P. Barkul](#) and [Meghshyam K. Patil*](#)^{ID}

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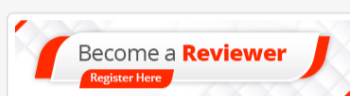
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Abstract

Background: Different photocatalysts such as TiO₂, ZnO and WO₃ have been used for the degradation of organic pollutants. However, these materials have some limitations, which have been affected the catalytic efficiency in the various transformations. The composites of these materials with other oxides can produce better results by tuning structural as well as optoelectrical properties. The composite of TiO₂ with ZrO₂ has attracted attention due to its use in different areas, as ZrO₂ and TiO₂ have similar physicochemical features.

Methods: This research contains the preparation of ZrO₂-TiO₂ nanocomposites by hydrothermal method and analysis of photocatalytic activity for the degradation of methylene blue and a mixture of dyes under visible light irradiation.

Results: Physicochemical characterization of ZrO₂-TiO₂ nanocomposites has been studied by using different techniques. Prepared catalysts has shown anatase phase of TiO₂ and tetragonal phase of ZrO₂. XRD, FESEM and HRTEM have supported the nanocrystalline nature of the composites. The photocatalytic activity of composites and bare TiO₂ samples were demonstrated for the degradation of methylene blue dye. Enhanced activity has been shown by composite having Ti:Zr 3:1 molar proportion, i.e., Ti₃Zr. Effect of concentration of methylene blue, pH of the solution and catalyst loading have been studied by using Ti₃Zr. In addition, the degradation of a mixture of three dyes, namely methylene blue, rhodamine B and methyl orange, has been studied.

Conclusion: In summary, prepared ZrO₂-TiO₂ composites found to be nanocrystalline and visible light active. These catalysts have shown activity for photocatalytic degradation of methylene blue and a mixture of dyes.

Keywords: [Nanocomposite](#), [photocatalysts](#), [hydrothermal](#), [dye degradation](#), [visible light irradiation](#), [TiO₂](#).

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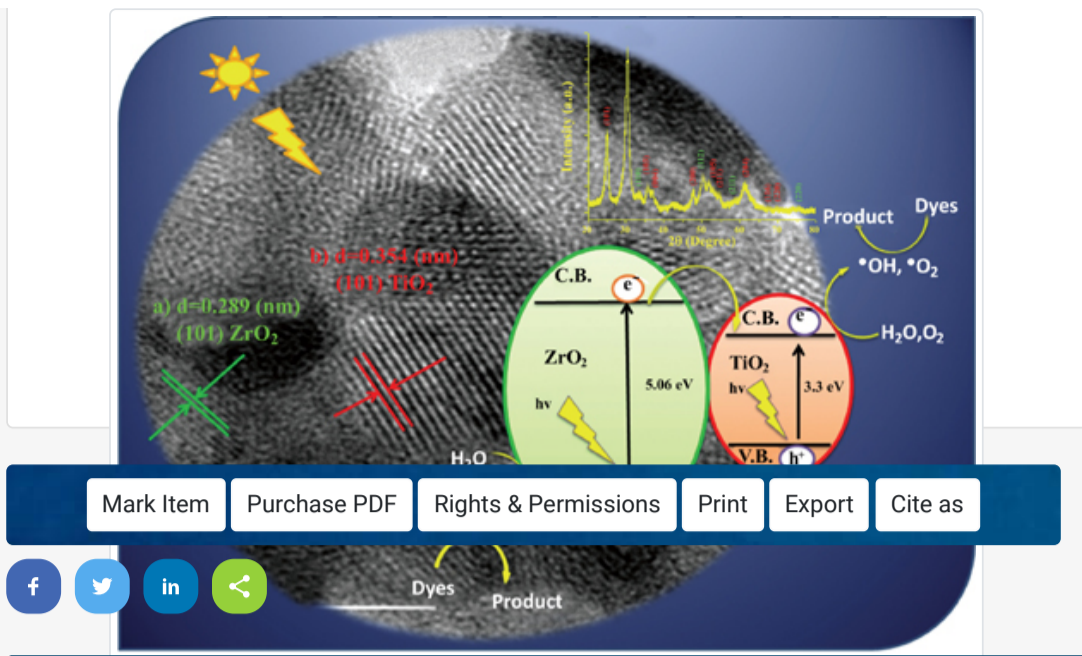
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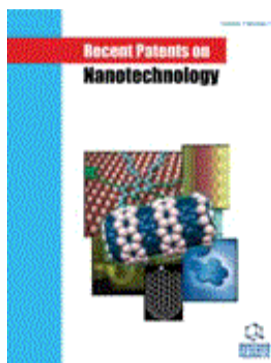
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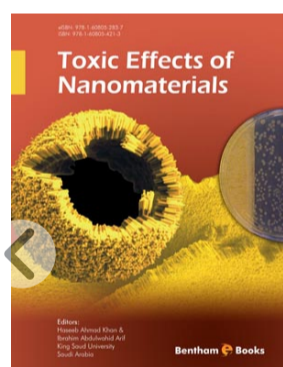
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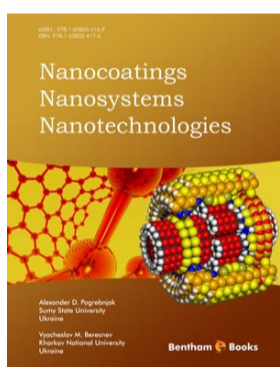
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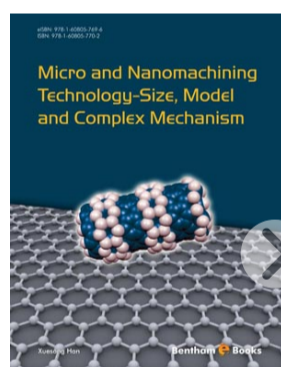
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