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ACRYLIC ACID GRAFTED BIOPOLYMER CHITOSAN/TiO_2 BASED NANOCOMPOSITE FOR APPLICATION IN SOLAR LIGHT INDUCED PHOTOCATALYTIC DEGRADATION

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The present investigation reports the greener synthesis and characterization of acrylic acid grafted biopolymer chitosan/TiO_2 based nanocomposites. The nanocomposites formed from metal/metal oxide nanoparticles and polymers showed the improvement in material properties such as electrical, chemical or biochemical properties along with permeability and selectivity. The polymeric and inorganic hybrid materials can be tailored to have the desired applications. The eco-friendly synthesis of amphoteric chitosan was done by grafting of acrylic acid to chitosan in presence of potassium persulfate by free radical polymerization. The grafted chitosan was further employed to synthesize nanocomposite by in situ reaction with semiconductor TiO_2 prepared from titanium butoxide using ultrasonication cavitation technique. FT-IR spectroscopy, XRD, EDX and thermal analysis techniques were employed to characterize synthesized CA (acrylic acid/chitosan) and CATN (CA/TiO_2). The change in surface morphology was evident from appearance of uniform globular particles of synthesized hybrid material instead of cloudy flakes of grafted chitosan. The homogenous distribution of metal oxide nanoparticles in CA/TiO_2 hybrid material was achieved from grafted acrylic acid/ chitosan containing weak anionic group (-COOH) which lead to the coiling of the polymeric chains around TiO_2. The response of polymeric nanocomposite, CATN was investigated for degradation of dyes often present in the effluents of textile industries. Malachite green was selected as model dye to assess the photocatalytic efficiency using solar light. The degradation kinetics was studied by monitoring the photo catalytic reaction by employing spectrophotometric technique. The rate constant of reaction for degradation of malachite green was found to be 7.13x10-3min-1. The current research work opens vistas for the new dimensions in area of water treatment by solving the issues related to degradation reaction efficiency in visible light and cost effectiveness.

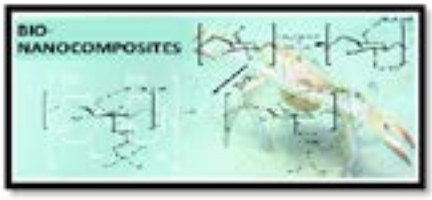

Figure 1: Synthesis of CAT nanocomposite for photocatalytic degradation of organic pollutants

Recent Publications

1. Moon Y E (2013) Poly (vinyl alcohol)/poly (acrylic acid)/TiO_2/graphene oxide nanocomposite hydrogels for pH-sensitive photocatalytic degradation of organic pollutants. Materials Science and Engineering: B. 178:1097-1103.
2. Bet Moushoul et al. (2016) TiO_2 nanocomposite based polymeric membranes: a review on performance improvement for various applications in chemical engineering processes. Chemical Engineering Journal. 283:29-46.
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Biography

Dhiraj Sud is a Professor of Chemistry and currently working in the area of nanophotocatalysis and development of hybrid materials for various applications in particular for environmental remediation. She has expertise in design, synthesis and characterization of nonmaterial as well as polymeric materials. Another area of her interest is in reaction kinetics and mechanism of photo catalytic reactions by tracking the reaction pathway. Besides teaching inorganic chemistry to post graduate students, she has also contributed in development of education and research as Dean Academics. She has more than 80 publications in international journal of repute and presented her research in number of national and international conferences. She also had written many chapters and two books. She has worked on sponsored research projects in the area of photo catalysis, adsorption technology and for treatment of industrial effluents. She has guided ten PhD students and many postgraduate student projects.

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