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Advanced Nanotechnology-Based Approaches to Waste Water Purification from Organic Pollutants

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Abstract

Advanced nanotechnology-based approaches to waste water purification is attracting more and more attention at the present time. Among several types of advanced oxidation processes (AOPs), heterogeneous photocatalytic decomposition using a solid semiconductor photocatalyst and UV radiation of low concentrated, hihgly toxic, hardly decomposable impurities should be distinguished. One such organic substance that requires wastewater treatment before being discharged into the aquatic system is phenol and its derivatives, which are known to be endocrine disruptors. Heterogeneous photocatalysis using titanium dioxide and ultraviolet radiation has been successfully used in suspended slurry photoreactors.

A photocatalyst (NTD) based on nanosized anatase and diatomite as a substrate has been synthesized in an electrolyser and applied for the photodecomposition of phenol in a slurry-type photoreactor.

The parameters affecting the adsorption and the degree of photodecomposition were determined: the initial phenol concentration, pH of the solution, dose of the photocatalyst, and duration of UV irradiation.

It is shown that photocatalysis with NTD under UV radiation makes it possible to achieve the degree of purification of the aqueous phenol solution up to the MAC (maximum allowable concentration) level for wastewater (5 mg/l) at an initial phenol concentration of 11 mg/l, a catalyst dose of 2 g/l, pH = 4.5 during 32 min of the process.

Keywords: waste waters, water purification, heterogeneous photocatalysis, nanosized anatase, hybrid photocatalyst, phenol, organic pollutants

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