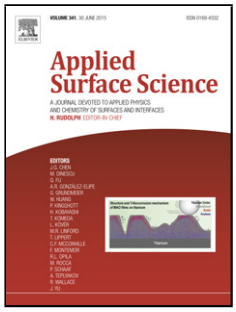

Title: Titanium dioxide nanoparticles modified by salicylic acid and arginine: structure, surface properties and photocatalytic decomposition of p-nitrophenol

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Titanium dioxide nanoparticles modified by salicylic acid and arginine: structure, surface properties and photocatalytic decomposition of p-nitrophenol

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1. SA and Arg was modified through the method of dipping treatment-based on chemical adsorption in saturated solution.
2. Surface modified TiO_2 applied in photodecomposition of nitroaromatic.
3. The photoreduction of nitroaromatic and photocatalytic activity under visible light irradiation were enhanced by TiO_2-SA-Arg.
4. TiO_2-SA-Arg showed better lipophilic, dispersion and adsorption properties.

ABSTRACT: In this study, titanium dioxide (TiO_2) nanoparticles were surface-modified with salicylic acid (SA) and arginine (Arg) using an environmentally friendly and convenient method, and the bonding structure, surface properties and degradation efficiency of p-nitrophenol (PNP) were investigated. X-ray diffractometry (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Brunauer-Emmett-Teller (BET), X-ray photoelectron spectroscopy (XPS), Fourier-transform infrared spectroscopy (FT-IR), water contact angle (WCA) measurements, ζ-potentiometric analysis, UV/visible diffuse reflectance spectroscopy (UV-Vis DRS), and thermogravimetric analysis (TGA) were performed to evaluate the modification effect. The degradation rates were determined by high-performance liquid chromatography (HPLC). The results show that bidentate or bridging bonds are most likely formed between SA/Arg and TiO_2 surface. Surface modification with SA, Arg, or both can improve the lipophilic properties and decrease the zeta potential, and also result in a red shift of the absorption wavelength. TiO_2 nanoparticles modified by Arg or both SA and Arg show a large specific surface area and pore volume. Further, degradation experiments under visible light show that Arg modification is most efficient. This simple and versatile synthetic method to produce TiO_2 nanoparticles surface-modified with various organic capping agents can be used for novel multifunctional photocatalysts as required for various applications in energy saving and enviromental protection.

KEYWORDS: Titanium dioxide, surface functionalization, salicylic acid, arginine, surface properties, photocatalytic decomposition, p-nitrophenol

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