Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

The Efficacy Of Surface Modified Nano Titanium Dioxide Against Photocatalytic Activity from Ultraviolet Irradiation

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We have used sonochemistry to synthesize a multi-component coating for TiO_2 nanoparticles to minimize the harmful effects of reactive oxygen species (ROS) from nano rutile TiO_2. We measured the FTIR spectra of the coated particles and found that the coating was very robust and none of the components were removed even after vigorous washing in deionized water. We used Thermal Gravimetric Analysis (TGA) to estimate the amount of polymer brushes attached to the TiO_2 particle and further derived the thickness of the coating. The in vitro SPF result showed no difference between the coated TiO_2 and uncoated TiO_2. The ability of these particles to scavenge free radicals was also tested using dyes in which DNA was exposed to UVA, UVB, and UVC wavelength. We found that the dye solution containing the uncoated TiO_2 particles rapidly became clear upon exposure to all UV wavelengths. In contrast, the samples containing the functionalized particles did not change color with Ultraviolet-visible spectroscopy even when irradiated with 5.4 $\mu\omega/cm^2$UVA and UVB for 27 hours. λ DNA exposed to UVA, UVB, and UVC for as little as 0.5hr began to show chain scission when subjected to electrophoresis. DNA exposed to UVB and UVC, in the presence of TiO_2 particles did not show any damage. We therefore conclude that the free radicals were responsible for the breakage, and the presence of free radical scavengers minimizes their effectiveness in destroying DNA.

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