Project Titan-Phyto: The Effects of Titanium Dioxide Nanoparticles on Marine Phytoplankton

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Under UV light, titanium dioxide performs photocatalytic reactions which produce harmful reactive oxygen species such as hydrogen peroxide, which causes phytoplankton mortality. Project Titan-Phyto investigates this killing mechanism by experimenting with different concentrations of titanium dioxide under UV light on the primary productivity of phytoplankton. The results of the project confirm the hypothesis that under UV light, the greater the amount of titanium dioxide added, the greater the decrease in the productivity of the phytoplankton. Phytoplankton samples were contained in 9 different flasks and cultured under sufficient conditions for 10 days before the addition of titanium dioxide. Three treatments of titanium dioxide were tested: 0 mg, 1 mg, and 10 mg; each treatment has 3 trials. Two trials of the same treatment were then placed under UV light for the next 72 hours while the remaining one trial was placed separately without UV light exposure. Dissolved oxygen in each flask was measured every 24 hours using an optical dissolved oxygen probe. The results of the experiment indicate a dose-response relationship between the amount of titanium dioxide added and the mortality of the phytoplankton. Specifically, the average decrease in dissolved oxygen becomes greater as the dosage of titanium dioxide increases from 0 mg to 1 mg to 10 mg: from 1.8 mg/L to 2.4 mg/L to 5.8 mg/L accordingly. On the contrary, the decrease in dissolved oxygen in the control group only varies from 0.6 mg/L to 0.83 mg/L to 1.37 mg/L respectively. Project Titan-Phyto achieves its initial goal to determine the effect of titanium dioxide on marine phytoplankton.

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