Photodegradation of Organic Dyes through Improved Catalysis across a Graphene Oxide-Doped Titanium Dioxide Substrate

Battogtokh, Bilguunzaya

Water and energy are linked. Water is needed for energy production and energy is needed for clean water production. Because many have limited access to both water and electricity, sustainable methods of water purification need to be developed. Titanium dioxide photocatalysis may be the answer. When UV light irradiates TiO_2 (band gap between 3-3.5eV), electron hole pairs are created which form free radicals that can decompose organic pollutants. Drawbacks of TiO_2 photocatalysis are fast electron hole recombination and limited light range. Doping titanium dioxide with graphene oxide can solve both these issues; GO is an electron acceptor and would narrow the bandgap. The hypothesis is that GO-doped TiO_2 would be more efficient and would work under visible light conditions. Graphene oxide was created via Tour's method resulting in two different types of GO: brown (Br) and black (Bl). Films were made by grinding particles, making paste, spreading paste on a glass slide and heating before use. The films (Control, TiO_2, BrGO-TiO_2, BlGO-TiO_2) were placed in a red food dye solutions under UV and Visible Light and samples were collected for testing in 30 minute intervals. Data was collected using a UV-Vis Spectrometer. BrGO-TiO_2 was the most effective under UV light (perhaps aided by photolysis) and was also most effective under Visible light (but complete degradation would take a longer time). The BrGO-TiO_2 was more effective than BlGO-TiO_2 because BlGO is probably reduced graphene oxide (no room for TiO_2 to anchor on). Ultimately, more experimentation is needed for confirm trends.