

Sunflower oil can be used as a sustainable templating agent for the development of highly porous, robust titanosilicates in fused microspherical morphology. These novel, cost effective, materials can act as highly effective adsorbents and photocatalysts for the removal of organic pollutants such as pesticides, pharmaceuticals etc., from water. In this study, Rhodamine B (Rh B) was used as a model organic water pollutant. Rh B molecules are initially adsorbed on to the titanosilicate surface and are eventually degraded into CO<sub>2</sub> and water *via* photocatalysis. The mechanism of photocatalysis occurs *via* formation of radicals such as O<sub>2</sub><sup>-•</sup> and OH<sup>•</sup>, initiated by sunlight-driven free electron generation on the titanosilicate surface. These sunflower oil based titanosilicates are robust, recyclable, are ~50% cheaper to produce on a laboratory scale and displayed up to three times the reaction rates of their conventional counterparts. They are also shown to have superior stability in water and display advanced - light absorption properties, compared to other conventional photocatalysts. Thus, they have the potential to be used as sustainable yet effective alternatives in tertiary water treatment.