Sunlight-driven degradation of non-steroidal anti-inflammatory drugs by innovative floating photocatalysts

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Among the most well-known pharmaceuticals, non-steroidal anti-inflammatory drugs (NSAIDs) are characterized by a broad scope of properties widely used in human and veterinary medicine.
Because of the growth and aging of the world population, high consumption of NSAIDs has been recorded in the last few years. Consequently, an increase in concentrations of pharmaceuticals in surface waters is on the rise, also due to the low removal efficiency of wastewater treatment plants. Although these drugs have been known for a long time, some information about them is still limited, such as their presence in water bodies, distribution, and eco-toxicological effects.
The traditional wastewater treatment plants have not been effective and efficient enough to remove these pharmaceuticals. To overcome this limitation, new routes are being evaluated for their efficiency in removing these pollutants. Advanced oxidation processes (AOPs) can successfully remove pharmaceuticals from wastewater. Among all the possible exploitable strategies in this field, heterogeneous photocatalysis has emerged as an interesting strategy, operating under mild conditions and degrading many pollutants without adding chemical oxidants. Although TiO_2 is still the most used semiconductor due to its chemical and physical stability, good photoactivity, and low cost, researchers are willing to replace it with new smart materials because of its limited activity under solar light and low thermal stability. Moreover, new floating substrates were employed to immobilize photocatalysts to overcome problems related to the use of slurry systems for water purification. Since their closeness to the water surface, these devices can be fully irradiated by the light source, better oxygenated, and easily recovered and reused. Herein, we present our recent results in the NSAIDs degradation under solar light irradiation by innovative visible active photocatalysts (g-C_3N_4, BiOX) immobilized on natural floating materials (Lightweight Expanded Clay Aggregate (LECA), alginates' spheres).