EVALUATING THE FATE OF FOUR ULTRAVIOLET FILTERS IN THE SUBSURFACE: THE EFFECT OF REDOX CONDITIONS IN DEGRADATION AND SORPTION

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Ultraviolet filters (UV) are widely used as personal and care products, like cosmetics and sunscreens, but also in industrial applications. Consequently, they are one of the most common emerging organic compounds found in water systems. Both sorption and degradation are the main processes governing the fate of these compounds in waters and, thus, their bioavailability and toxicity to ecosystems and humans. Normally degradation is driven by co-metabolism, being much more efficient in the presence of labile organic carbon. It has been studied that redox conditions also interferes in the degradation of these compounds. On the other hand, sorption plays a central role in the fate of UV-filters, since the interaction of these compounds with sedimentary organic matter is not negligible. Besides this, they also have been found sorbed into biological materials.

Considering that co-metabolic degradation is enhanced by biomass, and that biomass can act as a sorbent of UV-filters, the goal of this work is to evaluate the role in sorption of biomass as a sorbent of UV-filters. Besides this, we want also to evaluate the importance of different redox conditions in the co-metabolic degradation and the paper of sedimentary organic matter as a sorbent. To achieve this goal, a conceptual and a numerical model were constructed. The models were validated with published data by Liu et al. (2013), consisting in different batch experiments evaluating the fate of a cocktail of UVs under different redox conditions. The compounds evaluated included ionic UV filters (Benzophenone-3; the benzotriazoles (UV-326 and UV-329)) and neutral ones (octyl 4-methoxycinnamatte; and octocrylene).