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On clean-up of iodinated X-ray contrast media agents from surface waters

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Iodinated X-ray contrast media (ICM) agents are a class of pharmaceuticals and personal care products (PPCPs) of growing concern in environmental science as emerging contaminants [1, 2]. ICMs are the primary source of adsorbable organic iodine responsible for the formation of iodinated disinfection byproducts (I-DBPs), highly toxic compounds commonly found in surface waters [3]; as such, prevention and remediation strategies are necessary for the removal of these contaminants from natural waters [4, 5]. Nonetheless, there currently does not exist a scalable, environmentally safe, and efficient strategy for their removal from natural waters. Adsorption systems are routinely used in water treatment and purification from contaminants, and have the major advantage of preventing the formation and release of toxic byproducts [6]. In addition, adsorption of ICM agents to potential absorbents is an approach for purification of water resources from this emerging contaminant. To this end, studies investigating the sorption dynamics of these compounds to candidate sorbent materials, in different experimental conditions, are needed.

In the present study, the adsorption capacity of the non-ionic ICM iopamidol and the ionic ICM diatrizoate onto candidate sorbent materials has been investigated by means of single sorption batch tests, under both equilibrium and kinetic conditions. Column tests have also been performed to highlight the influence of contact time and dynamic flow conditions on the sorption process, with experimental conditions selected based on their relevance for field applications.

In batch equilibrium tests, neither ICM agents showed sorption to soils, thus highlighting their peculiar nature as non-lipophilic contaminants remaining in the water phase [7]. A novel iron oxide-based colloidal suspension was also incapable of removing the target compounds, thus highlighting the need for sorbent materials with specific characteristics. A pelletized activated carbon sorbent material was successful in removing the target ICM agents in different experimental conditions. Effect of a variety of influencing factors such as amount of sorbent and sorbates, contact time, and hydrodynamic condition on the removal rate of the ICM agents were analysed. The results, gathered with the aim of understanding the key principles and dynamics behind ICM agents adsorption, offer a new set of data that inform one how to design tailored removal strategies and industrial treatment processes.

Participation

In-Person

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