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Chitosan-Based Sponges as Adsorbent Substrates for Water Remediation

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Extended Abstract

Recently, the presence of Contaminants of Emerging Concern (CECs) and other pollutants, such as textile dyes, in the environment, particularly in water bodies, is representing a problem of global interest [1]. To face this issue, this work proposes the use of a material able to absorb pollutants from water with high efficiency. Specifically, by following the Circular Economy principles, the preparation of an adsorbent material using wastes coming from ichthyic and food-agricultural industries was attained, for finally obtaining chitosan sponges in which biochar from olive pomace and TiO_2 were added. The sponges were used for removing of two pollutants: Carbamazepine (CBZ), a psychoactive drug belonging to the class of iminostilbenes used in the treatment of bipolar disorder and schizophrenia for its anticonvulsant activity, and Direct Blue-78 (DB-78), a non-biodegradable [2] azo dye used in textile processes. To investigate the adsorption process, the effects of various chemical-physical parameters were studied. Additionally, the kinetic models of PFO (Pseudo-First Order), PSO (Pseudo-Second Order) and Webber-Morris were applied, along with Langmuir, Freundlich, Temkin and Dubinin-Radushkevich isotherm models. The thermodynamic parameters were also obtained to evaluate the endothermic character and to verify the spontaneity of the adsorption process. Furthermore, under suitable conditions of work, the desorption and the solid-state photodegradation of contaminants were proposed to recycle the adsorbent for several cycles attending its lifetime. For the purpose, TiO_2 was added as a photocatalyst [3] for promoting Advanced Oxidation Processes (AOPs) to photodegrade the pollutants after their adsorption.

References

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