TREATMENT OF WATER POLLUTED WITH OXYTETRACYCLINE BY ADSORPTION ONTO MODIFIED EGGSHELLS

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Abstract - Environmental pollution as a consequence of technological evolvement has become one of the most crucial problems of the century [1]. Pharmaceutical pollutants (PPs) are a group of emerging anthropogenic hazard contaminants that contain different groups of human and veterinary medicinal compounds that are used widely all over the globe. PPs exist in the environment at a very low concentration but, generally due to their bio-accumulation, they pose a potential long-term risk for aquatic and terrestrial organisms.. Among the pharmaceuticals pollutants, the antibiotics deserve special attention because they are used in very large quantities and are biologically active molecules that can interact with specific biological targets leading to emergence of the phenomenon of microorganism's resistance towards the potential pathogens such as bacteria. The adsorption process under laboratory conditions showed promising results in oxytetracyclin wastewater treatment in comparison with the traditional methods to treat pharmaceuticals discharge. Adsorbents that are commercially available, e.g., commercially activated carbon, are very effective but expensive [2,3]. Therefore, research is currently focused on adsorbents that remove pharmaceuticals pollutants from wastewater at a low cost [4,5]. An adsorbent can be considered low cost if it requires little processing is abundant in nature, or is a byproduct or waste material from another industry. Therefore, the natural adsorbents have gained much attention for the adsorption of various pollutants from an aqueous medium [6].This study, undertaken in a context of waste valorisation and environment protection, consisted in the elimination of a pharmaceutical micro-polluant present in the aquatic ecosystem, oxytetracycline, by adsorption on a very abundant agro-food waste in Algeria, eggshells. These were used in two different states: natural and calcined. The influence of several parameters (the contact time, the adsorbent mass, the initial pollutant concentration and the temperature) on the sorption capacity of the two types of eggshells was investigated. The best removal rate (nearly 55%) is obtained with activated eggshells for an initial pollutant concentration of 10 mg/L, a solid/liquid ratio of 8 g/L and a free pH. The modeling of the experimental results shows that the adsorption kinetics follows the pseudo-first order model and the adsorption isotherms are well described by the Langmuir model. Moreover, the thermodynamic study suggests that the phenomenon is exothermic and not spontaneous under the considered conditions.

Key words - Adsorption, oxytetracycline, eggshells, water treatment

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