

Valorization of Lignocellulosic Wastes- Evaluation of Its Toxicity When Used in Adsorption Systems

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Abstract : The agriculture lignocellulosic by-products are receiving increased attention, namely in the search for filter materials that retain contaminants from water. These by-products, specifically almond and hazelnut shells are abundant in Portugal once almond and hazelnuts production is a local important activity. Hazelnut and almond shells have as main constituents lignin, cellulose and hemicelluloses, water soluble extractives and tannins. Along the adsorption of heavy metals from contaminated waters, water soluble compounds can leach from shells and have a negative impact in the environment. Usually, the chemical characterization of treated water by itself may not show environmental impact caused by the discharges when parameters obey to legal quality standards for water. Only biological systems can detect the toxic effects of the water constituents. Therefore, the evaluation of toxicity by biological tests is very important when deciding the suitability for safe water discharge or for irrigation applications. The main purpose of the present work was to assess the potential impacts of waters after been treated for heavy metal removal by hazelnut and almond shells adsorption systems, with short term acute toxicity tests. To conduct the study, water at pH 6 with 25 mg.L⁻¹ of lead, was treated with 10 g of shell per litre of wastewater, for 24 hours. This procedure was followed for each bark. Afterwards the water was collected for toxicological assays; namely bacterial resistance, seed germination, Lemna minor L. test and plant grow. The effect in isolated bacteria strains was determined by disc diffusion method and the germination index of seed was evaluated using lettuce, with temperature and humidity germination control for 7 days. For aquatic higher organism, Lemnas were used with 4 days contact time with shell solutions, in controlled light and temperature. For terrestrial higher plants, biomass production was evaluated after 14 days of tomato germination had occurred in soil, with controlled humidity, light and temperature. Toxicity tests of water treated with shells revealed in some extent effects in the tested organisms, with the test assays showing a close behaviour as the control, leading to the conclusion that its further utilization may not be considered to create a serious risk to the environment.

Keywords : lignocellulosic wastes, adsorption, acute toxicity tests, risk assessment

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