ADSORPTION OF PESTICIDES ONTO ACTIVATED CARBONS FROM WOOD COMPOSITES

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Abstract

Agricultural residues such as pesticides are widely found on water courses and in water treatment facilities near large farming fields, a great concern according to the World Health Organization [1]. Activated carbons are an important part of the water treatment process thanks to their great adsorption properties. The constant demand for innovative, environmental friendly and cheaper activated carbon materials, retaining or increasing the capabilities as the ones nowadays found in the market, the usage of industrial by-products to produce these materials can be the way to follow in order to ally the material efficiency and its final cost [2].
Medium-density fibreboard (MDF) and particleboard (PB) monoliths were used as precursor resulting on activated carbon samples that retain the initial shape, as presented in figure 1. Series of activated carbon were produced trough physical activation with CO_2, at 1073 K or chemical activation with several chemical agents, such as KOH, K_2CO_3 and H_3PO_4, at different temperatures [2 - 4].
A complete characterization of all activated carbon was achieved through different methods, normally used for these purpose, such as N_2 adsorption at 77 K, X-ray diffraction, CHNS-O elemental analysis, FTIR, thermo-gravimetrical analysis, He density and point of zero charge.

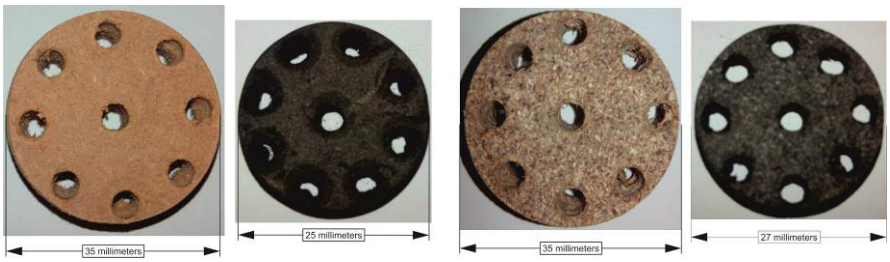

Figure 1 - Precursors and respective activated carbon

Figure 2 - Liquid phase adsorption experiment

The nitrogen isotherms were essentially of type I, corresponding to a microporous structure. The activated carbon presenting a wider mean pore size were selected to be tested for 2,4 D, MCPA and diuron removal from the liquid phase. Adsorption isotherms of different pesticides were carried out in batch assays at 298 K, as presented in figure 2, being the remaining concentration measured by UV-Vis spectroscopy at specific wavelengths for each one. The amount of pesticides adsorbed on the activated carbon was then calculated by difference between the initial (known) and the final (measured) concentrations and the adsorption isotherms were obtained. Previous studies on the influence of pH and contact time were performed in order to delineate the ideal adsorption parameters for each pesticide [5].
The results obtained for the pesticides in study point us in a good direction onto the real life application of these materials. The monolithic shape can be retained after the production process, allowing a cheaper and easier usage on flow applications.

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