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## FUNCTIONALIZED SILICA MATERIALS AS ADSORBENTS FOR REMOVING METOLACHLOR AND PENDIMETHALIN FROM WATER

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### Abstract

The main objective of this research is to test functionalized siliceous materials as adsorbents to reduce the concentration of herbicides metolachlor and pendimethalin in aqueous solutions, and therefore contribute to the search of new materials for removal of herbicides from polluted water. Commercial silica was functionalized with mercaptopropyl and aminopropyl moieties. Aminopropyl silica was post-modified with phenoxyacetyl and benzoyl groups. Characterization of these functionalized materials has been done by means of nitrogen adsorption isotherms (in order to obtain textural properties), infrared spectroscopy and thermogravimetric analysis (to explore their chemical features). Adsorption kinetics and isotherms of metolachlor and pendimethalin were studied in batch experiments. Nitrogen adsorption isotherms show that functionalization reactions lower the total surface area of the solids. On the other hand, infrared spectra and thermogravimetric analysis confirm functionalization. Respecting adsorption kinetics, the process follows a pseudo-second order pattern in all cases. Adsorption isotherms can be described by Sips model, and they can be classified as S type in most of the cases. Silica functionalized with benzoylamidopropyl moieties exhibits the highest adsorption effectiveness towards both herbicides. It has 170% and 360% higher adsorption capacity than silica towards metolachlor and pendimethalin, respectively; while residual herbicide left in solution after adsorption practically reduces to a half when compared with silica. It can be concluded that chemical modification of the surfaces can be directed towards the discovery of new materials for water remediation.

*Key words:* adsorption, functionalization, metolachlor, pendimethalin

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