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# A Comparative Study on Activated Carbons Derived from a Broad Range of Agro-industrial Wastes in Removal of Large-Molecular-Size Organic Pollutants in Aqueous Phase

Article · June 2015 with 92 Reads

DOI: 10.1007/s11270-015-2474-7

 <p>1st <b>Gerardo J. F. Cruz</b> 9.32 · Universidad Nacional de Tumbes</p>	 <p>2nd <b>Lenka Matejova</b> 32.1 · The Czech Academy of Sciences</p>	
 <p>3rd <b>Minna Piriälä</b> 13.93 · University of Oulu</p>	<p>+ 5</p>	 <p>Last <b>Riitta L. Keiski</b></p>

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## Abstract

Microporous–mesoporous activated carbons from five different types of agro-industrial wastes were produced using chemical activation with ZnCl<sub>2</sub> and carbonization at mild conditions of 600 °C, comprehensively characterized and investigated for removal of methylene blue (MB) in aqueous solution, a model large-molecular-size organic pollutant. The external part of the mango pit (mango seed husk) was used for the production of activated carbon (AC) for the first time. Despite that the raw agro-materials exhibited significantly different porosity, all activated carbons produced possessed well-developed microporous–mesoporous structures showing high surface areas and micropore volumes. Further, it was revealed that the pore size distribution of raw agro-material is a more important property in development of microporous–mesoporous structure of produced ACs than their overall porosity. All activated carbons produced adsorbed MB, reaching in most cases 100 % removal from the aqueous phase. Adsorption data were fitted well to a pseudo-second-order kinetic model. For MB adsorption, the mesoporosity and the ratio of micropores accessible for MB were the key factors since there exists the size selectivity effect on MB adsorption due to MB molecular dimensions. The molecular dimensions of MB were estimated via DFT calculations to 1.66×0.82×0.54 nm, and this parameter was correlated with determined micropore size distributions of activated carbons.

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