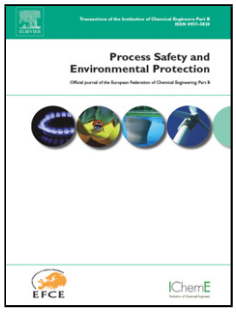

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PII: S0957-5820(17)30150-7
DOI: http://dx.doi.org/doi:10.1016/j.psep.2017.05.002
Reference: PSEP 1063

To appear in: *Process Safety and Environment Protection*

Received date: 23-8-2015
Revised date: 8-12-2016
Accepted date: 2-5-2017

Please cite this article as: Yavari, Saba, Malakahmad, Amirhossein, Sapari, Nasiman B., Yavari, Sara, Sorption Properties Optimization of Agricultural Wastes-Derived Biochars using Response Surface Methodology.Process Safety and Environment Protection http://dx.doi.org/10.1016/j.psep.2017.05.002

Sorption Properties Optimization of Agricultural Wastes-Derived Biochars using Response Surface Methodology

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Highlights:

- Biochar surface area, CEC, pores and organic carbon affected sorption potential.
- Production variables were optimized statistically to adjust the biochar properties.
- EFB biochar was optimized at temperature of 493°C and heating rate of 3°C/min in 1 hr.
- RH biochar was optimized at temperature of 700°C and heating rate of 3°C/min in 3 hrs.
- EFB biochar with higher CEC value was more effective on sorption of imazapic.

Abstract

Pyrolysis of biomass into biochar and application of a carbon-rich product to water and soil media have been demonstrated to be effective in sequestering of contaminants. Fundamentally, biochar characteristics are controlled by feedstock and pyrolysis variables. The present study investigated the effects of synthesis variables (highest treatment temperature, heating rate and residence time) on biochar sorption properties. Oil palm empty fruit bunch (EFB) and rice husk (RH) biomasses were compared as initial feedstock. The variables were optimized using response surface methodology (RSM) to optimize the values of responses including biochars organic carbon content, cation exchange capacity (CEC), surface area and pores volume. Sorption performances of the optimized biochars were further investigated in removal of a polar imidazolinone herbicide from soil. Based on the results, pyrolysis temperature was the most effective variable on the responses followed by residence time and heating rate. Optimum conditions to maximize the