

基于正交实验设计的菠萝顶花基活化生物
炭的制备及其性能研究

**Preparation and Properties of Activated Biochar from
Pineapple Top Flower Based on Orthogonal Design**

摘 要

以农业废料菠萝顶花为原料,运用三因素三水平正交法,探究不同炭碱/酸比(1:1、1:3、1:5),不同活化温度(650℃、750℃、850℃),不同活化时间(0.5h、1h、2h)制成的菠萝顶花活性炭对亚甲基蓝溶液和甲基橙溶液的动力学吸附的影响,从而选择出吸附性最强的活化条件。实验结果表明使用氢氧化钾做活化剂的活性炭样品吸附效果明显高于使用磷酸作为活化剂的活性炭样品,且经活化后活性炭的吸附能力明显强于生物炭。经单指标正交试验设计的分析法分析实验结果最佳实验方案。氢氧化钾活性炭最优工艺条件:吸附亚甲基蓝时为物料比 1:3、活化温度 850℃、活化时间 30min; 吸附甲基橙时为物料比 1:3、活化温度 850℃、活化时间 30min。磷酸活性炭最优工艺条件:吸附亚甲基蓝时为物料比 1:3、活化温度 850℃、活化时间 120min; 吸附甲基橙时为物料比 1:5、活化温度 850℃、活化时间120min。据正交试验分析,3种因素均对活性炭的吸附性能有影响,对菠萝顶花活性炭吸附性能影响最大的因素是活化温度,且菠萝顶花-氢氧化钾活性炭中各种条件对吸附性的影响强度差异不大,而菠萝顶花-磷酸活性炭中条件对吸附性的影响强度有较明显的差异。根据数据的 R 值得出因素间不存在交互作用。

关键词: 菠萝顶花; 活性炭; 吸附; 正交实验

Preparation and Properties of Activated Biochar from Pineapple Top Flower Based on Orthogonal Design

Abstract

With agricultural waste pineapple flowers as raw material, using three-factors and three-levelled orthogonal experiment, and explore different carbon acid/alkali ratio (1:1,1:3,1:5), different activation temperature (650 °C, 750 °C, 850 °C), different activation time (0.5 h, 1 h, 2 h) pineapple top flowers made of activated carbon for methylene blue solution and the influence of the dynamic adsorption of methyl orange solution, to choose the strongest adsorption activation conditions. The results show that the adsorption effect of activated carbon samples which use potassium hydroxide as activator are significantly higher than that use phosphoric acid as activator, and the adsorption capacity of activated carbon was obviously stronger than the biochar. Use the single index orthogonal experimental to analyze optimal experimental scheme. Optimum process condition of potassium hydroxide activated carbon: activated carbon adsorption of methylene blue as a material than 1:3, at 850°C, for 30 min; adsorption of methyl orange as a material than 1:3, at 850°C, for 30min activation time. Optimal process condition of activated carbon of phosphoric acid: the adsorption of methylene blue as a material than 1:3, at 850 °C, for 120 min; adsorption of methyl orange as a material than 1:5, at 850 °C, for 120 min. According to orthogonal test analysis, the three factors all have an effect on the adsorption performance of activated carbon, the most important factor affecting the adsorption performance of activated carbon is the activation temperature, the influence of various conditions on the adsorption strength of pineapple acropolis-potassium hydroxide activated carbon is not significantly different, while the influence of various conditions on the adsorption strength of pineapple acropolis-phosphate activated carbon is obviously different. According to R value of data, there is no interaction between factors.

Key words: Pineapple Top Flower; Acticarbon; Adsorption; Orthogonal Experiment

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