

朱国营,陈萍萍·壳聚糖改性竹制粉末活性炭吸附剂对微囊藻毒素的吸附特性研究[J].环境科学学报,2012,32(4):790-795

壳聚糖改性竹制粉末活性炭吸附剂对微囊藻毒素的吸附特性研究

Adsorption characteristics of microcystin-RR by a synthetic powdered bamboo charcoal mixed with chitosan

关键词: [活性炭](#) [壳聚糖](#) [微囊藻毒素](#) [吸附](#) [吸附剂](#)

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摘要: 研究了壳聚糖改性的竹制粉末活性炭吸附剂对饮用水中微囊藻毒素Microcystin-RR(MCRR)的吸附效果和机理. 结果表明,这种新合成的吸附剂具有一定的孔结构,比表面积为 $203.63 \text{ m}^2 \cdot \text{g}^{-1}$,平均孔径为 7.23 nm ,并且具有较高比例的介孔分布,这种特性使得其对最长分子尺寸为 2.86 nm 的MCRR具有较好的捕捉效果. 吸附动力学实验表明,接触时间达到 100 min 后,吸附趋于稳定,该吸附剂对MCRR的吸附行为可以用Langmuir模型($C_e/Q_e=0.014C_e+0.81, R^2=0.99$)和Freundlich模型($\ln Q_e=0.61\ln C_e+1.04, R^2=0.99$)较好地描述;在中性条件下该吸附剂对MCRR的最大吸附量达到 $69.93 \mu\text{g} \cdot \text{g}^{-1}$,具有较强的吸附能力. 受吸附剂本身等电点及MCRR分子带电性能的影响,吸附剂对MCRR的吸附受pH影响较大,在 $\text{pH}=3$ 时吸附能力最强;此外,天然有机物(NOM)的存在会对MCRR的吸附产生明显的竞争作用. 脱附实验表明,改变脱附溶液的pH对提高脱附效率影响不大,甲醇作为脱附剂具有较好的脱附效果,脱附率可达到 96% .

Abstract: The adsorption effects of MCRR by a synthetic powdered bamboo charcoal mixed with chitosan were investigated. The BET surface of the adsorbent was $203.63 \text{ m}^2 \cdot \text{g}^{-1}$, and the average of pore size was 7.23 nm . Furthermore, the adsorbent had high percentages of mesopore, which resulted in good catch ability for MCRR with the maximum molecular length of 2.86 nm . The adsorption kinetics showed that the optimized contact time was 100 min . The adsorption behavior can be described by Langmuir model ($C_e/Q_e=0.014C_e+0.81, R^2=0.99$) and Freundlich model ($\ln Q_e=0.61\ln C_e+1.04, R^2=0.99$). In natural condition, the calculated Q_{\max} is $69.93 \mu\text{g} \cdot \text{g}^{-1}$. The adsorption effects were mainly dependent on the pH values, and the maximum adsorption happened on $\text{pH}=3$. For MCRR adsorption, NOMs are important competitive factors. The desorption behavior was lightly influenced by the pH values. Methanol was an efficient solution for MCRR desorption with the percentage of 96% .

Key words: [powdered charcoal](#) [chitosan](#) [MCRR](#) [adsorption](#) [adsorbent](#)

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