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### HDTMA改性沸石对三氯生的吸附特性研究

#### Adsorptive characteristics of triclosan on HDTMA modified zeolite

关键词: [HDTMA改性沸石](#) [吸附](#) [三氯生](#)

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作者 单位

- 何敏祯 1. 华南理工大学环境科学与工程学院,工业聚集区污染控制与生态修复教育部重点实验室,广州 510006;  
2. 华南理工大学制浆造纸工程国家重点实验室,广州 510640
- 胡勇有 1. 华南理工大学环境科学与工程学院,工业聚集区污染控制与生态修复教育部重点实验室,广州 510006;  
2. 华南理工大学制浆造纸工程国家重点实验室,广州 510640
- 雷超 1. 华南理工大学环境科学与工程学院,工业聚集区污染控制与生态修复教育部重点实验室,广州 510006;  
2. 华南理工大学制浆造纸工程国家重点实验室,广州 510640
- 任源 华南理工大学环境科学与工程学院,工业聚集区污染控制与生态修复教育部重点实验室,广州 510006

摘要: 采用固-液吸附法,以阳离子表面活性剂十六烷基三甲基溴化铵(HDTMA)为改性剂,制备了HDTMA质量与沸石表面阳离子交换容量(ECEC)百分比分别为50%、100%、150%和200%的HDTMA改性沸石(分别标记为S50、S100、S150和S200),并用元素分析、FTIR、XRD、BET和Zeta电位测试对HDTMA改性沸石进行了表征.同时,采用单因素吸附实验系统考察了HDTMA改性沸石吸附三氯生的主要影响因素.结果表明,HDTMA<sup>+</sup>成功负载并主要分布在沸石的表面,未改变原沸石的晶相结构.改性沸石的比表面积随HDTMA用量的增加而减小,表面正电荷随HDTMA用量的增加而增加.4种不同质量负载比的HDTMA改性沸石对三氯生的吸附均可在2 h内达到平衡;原沸石、S50、S100和S150对三氯生的吸附容量均随pH升高而降低,吸附的最佳pH为7.0,而S200在强碱性下吸附容量更大.在pH=7、NaCl离子强度0.001~0.5 mol·L<sup>-1</sup>内,较高的离子强度有利于三氯生的吸附.吸附等温线和热力学研究表明,HDTMA改性沸石对三氯生的吸附过程放热,吸附机制主要为分配作用,三氯生与改性沸石之间无化学键、配位基交换等强作用力.

**Abstract:** In this study, four different HDTMA-zeolites were prepared by a simple solid-liquid adsorption method. The modifier of hexadecyl trimethyl ammonium bromide (HDTMA) was added equal to 50%, 100%, 150% and 200% external cation exchange capacity (ECEC) of raw zeolite, which were then denoted as S50, S100, S150, and S200 respectively and were characterized by Elementary analysis (EA), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Brunauer-Emmett-Teller surface measurements (BET) and Zeta potential measurements. The factors which affected the adsorption of triclosan (TCS) by HDTMA-zeolites such as reaction time, initial concentration, pH, and ionic strength were also determined by single-factor batch experiments. The results showed that HDTMA<sup>+</sup> was adsorbed mainly on the surface and did not change the crystal structure of the raw zeolite. Increasing amount of HDTMA<sup>+</sup> decreased the specific surface but increased the positive charge on the surface of the HDTMA-zeolites. The adsorption equilibrium of TCS on HDTMA-zeolites can be reached within 2 hours. Sorption capacities of TCS onto raw zeolite, S50, S100, and S150 decreased with increase of pH. The optimum pH for sorption was determined as 7.0. The S200, however, was more efficient at higher pH. Higher ionic strength is more favorable for the sorption of TCS by the sorbents at pH 7 and ionic strength 0.001~0.5 mol·L<sup>-1</sup>. The functions of thermodynamics at 25~45 °C indicated that the adsorption of triclosan on HDTMA-zeolites was an exothermic process and there was just weak attraction between triclosan and the sorbents. The adsorption isotherms indicate that the sorption is mainly ascribed to partitioning.

**Key words:** [HDTMA-zeolite](#) [adsorption](#) [triclosan](#)

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服务热线：010-62941073 传真：010-62941073 Email: [hjkxxb@rcees.ac.cn](mailto:hjkxxb@rcees.ac.cn)

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