

研究论文

表面活性剂改性的螯合剂有机膨润土对水中有机污染物和重金属的协同吸附研究

孙洪良<sup>1,2</sup>, 朱利中<sup>1</sup>

1. 浙江大学环境科学系, 杭州 310028;
2. 浙江工商大学环境科学与工程系, 杭州 310035

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**摘要** 采用季铵盐阳离子(CTMA<sup>+</sup>)和有机螯合剂(Am)复合改性膨润土(IMB), 制得一系列螯合剂柱撑膨润土 IMB-CTMA-Am. 利用X射线衍射(XRD)分析、差热-热重(TG-DTA)分析、比表面积测定(N<sub>2</sub>-BET)以及元素分析等手段对吸附剂样品进行了表征. 结果表明, CTMA<sup>+</sup>和Am已柱撑进入膨润土层间. 吸附实验结果表明, IMB-CTMA-Am能同时有效地去除有机污染物对硝基苯酚(PNP)和重金属铅(Pb<sup>2+</sup>), 其对水中对硝基苯酚的强吸附能力来源于分配作用的增加和层间距的增大, 而与比表面积无关. 傅里叶变换红外光谱(FTIR)显示, IMB-CTMA-Am吸附Pb<sup>2+</sup>后的N—H吸收峰向低频方向移动, 表明Pb<sup>2+</sup>和膨润土层间的Am形成了稳定的配合物. 有机螯合剂Am和Pb<sup>2+</sup>所形成配合物的稳定性越大, IMB-CTMA-Am对Pb<sup>2+</sup>离子的吸附能力也就越强.

**关键词** [改性膨润土](#) [协同吸附](#) [季铵盐阳离子](#) [对硝基苯酚](#) [重金属](#)

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Simultaneous Adsorption of Organic Pollutant and Heavy Metal onto Surfactant-Modified Organobentonites with Chelating Ligands

SUN Hong-Liang<sup>1,2\*</sup>, ZHU Li-Zhong<sup>1</sup>

1. Department of Environmental Science, Zhejiang University, Hangzhou 310012, China;
2. Department of Environmental Science & Engineering, Zhejiang Gongshang University, Hangzhou 310035, China

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**Abstract** The surfactant-modified organobentonites with chelating ligands, IMB-CTMA-Am, were synthesized, where IMB refers to natural bentonite obtained from Inner Mongolia of China, CTMAB refers to quaternary ammonium cation surfactant of cetyltrimethylammonium bromide, and Am refers to the chelating ligands, respectively. The adsorbent samples were characterized by X-ray diffraction(XRD), thermogravimetric and differential thermal(TG-DTA) analyses, specific surface area(N<sub>2</sub>-BET) measurements, and elemental analysis. The results indicated that CTMA<sup>+</sup> and Am intercalated into the lamellae of bentonites successfully. The adsorption experiments showed that IMB-CTMA-Am could effectively adsorb organic pollutant *p*-nitrophenol(PNP) and heavy metal ion Pb<sup>2+</sup> in waste water system simultaneously. The adsorption capabilities of IMB-CTMA-Am are greater than natural bentonite IMB and modified bentonite IMB-CTMA. Fourier transform infrared(FTIR) spectrum study revealed that the N—H vibrational frequency of IMB-CTMA-Am was downshifted after Pb<sup>2+</sup> adsorption, which demonstrates the formation of a metal complex between metal ion Pb<sup>2+</sup> and Am in the interlayers of the modified bentonites. The adsorption capacity of Pb<sup>2+</sup> onto IMB-CTMA-Am agrees with the stability constant of the complex formed.

**Key words** [Modified bentonite](#); [Simultaneous adsorption](#); [Quaternary ammonium cation](#); [p-Nitrophenol](#); [Heavy metal](#)

通讯作者:

孙洪良 [sunhongliang@mail.zjgsu.edu.cn](mailto:sunhongliang@mail.zjgsu.edu.cn)

作者个人主页: 孙洪良<sup>1,2</sup>; 朱利中<sup>1</sup>

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