

微波改性膨润土对含铅废水的吸附过程研究

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Bentonite;; Microwave;; Modified;; Pb~(2+)-containing wastewater;; Adsorption mechanism
 本文针对含Pb2+重金属废水污染严重,危害大的特点,采用来源广泛、价格低廉、吸附能力强的膨润土对其进行处理,主要考察了膨润土微波改性的最佳制备条件以及对含铅废水的最佳吸附条件,并对实际含铅废水进行试验研究,最后对膨润土吸附含铅废水机理进行了探讨。 试验用膨润土为广西南宁产的钠化土。钠化土对铅离子的吸附性能不佳。为使膨润土能更有效的应用于含铅废水的处理,开展了膨润土的改性研究。试验得出了两种微波改性方法的最佳制备条件。微波土为:中功率辐照8min。有机微波土为:改性剂用量为3g/5g(土),反应液固比为10:5,乙醇体积浓度为75%,辐照强度Q>50W/g,辐照时间1.5min。由于有机微波土制备条件较为复杂,对其进行了正交优化试验,试验结果显示,改性剂用量对改性效果影响最大,其次为微波辐照时间和乙醇体积浓度。 试验利用改性膨润土进行了吸附试验,得出了对铅离子的最佳吸附条件。钠化土为:固液比为12g/L,T=40℃,吸附时间为50min,pH值为6,去除率达72.9%。微波土:固液比为12g/L,T=50℃,吸附时间为20min,pH值为6,去除率达86.7%。有机微波土:固液比为8g/L,T=50℃,吸附时间为10min,pH值为6,去除率达99.5%。本试验利用改性膨润土对实际酸性含铅废水进行了处理,结果表明有机微波土的吸附效果最佳,当pH值为8,固液比为5g/L时,铅的去除率为99.6%。 论文采用扫描电镜、IR和XRD等先进测试技术对改性膨润土进行了表征,并研究了其对铅离子的吸附机理。对有机微波土的等温吸附试验表明,该土对铅离子的吸附即符合Langmuir方程又符合Freundlich方程。 以上研究结果对利用膨润土吸附性能,特别是处理含铅废水有一定的理论和实践意义,同时为提高我国膨润土的应用价值开拓了一条新的途径。

Since Pb2+-containing wastewater is harmful to environment and threat our health,in this paper,used source widely,inexpensive,strong adsorption Bentonite to adsorb it. The writer mainly inspected the best making condition of bentonite by microwave modified,the best adsorption conditions towards Pb2+-containing wastewater, finally investigated adsorption mechanism. The bentonite used in the experiments was the Na-bentonite produced in Nanning,Guangxi. The Na-bentonite was not good regarding the adsorption performance of Pb2+.In order to make the bentonite suitable for the treatment of Pb2+-containing wastewater,we carried out the bentonite modification research. The experiments resulted in two methods by microwave and achieved the best making conditions. Microwave-bentonite : middle power , heating 8min. Organic-microwave-bentonite:modified reagent dosage was 3g/5g,solid-fluid ratio was10:5 , alcohol volume concentration was 75% , radiation intension was Q>50W/g , radiation time was 1.5min. In view of organic-microwave-bentonite preparation condition more complex,carried on the orthogonal optimization experiment to it, the test results demonstrated that modified reagent dosage was biggest to the modified effect influence, next for microwave exposure time and alcohol volume concentration. The adsorption experiments using the modified bentonite were carried out and the best adsorption conditions of Pb2+ was given. Na-bentonite:solid-fluid ratio was 12g/L, T=40℃,adsorption time was 50min, pH=6, removing rate achieved 72.9%. Microwave-bentonit:solid-fluid ratio was 12g/L,T=50℃,adsorption time was 20min, pH=6,removing rate achieved 86.7%. Organic-microwave-bentonite: solid-fluid ratio was 8g/L,T=50℃,adsorption time was10min, pH=6,removing rate achieved 99.5%. In this experiment,the modified bentonite was used to treat the actual acidity Pb2+-containing wastewater, indicated the adsorption effect of organic-microwave-bentonite was best,when pH=8, the solid fluid ratio was 5g/L,removing rate achieved 99.6%. The paper used the advanced testing techniques such as SEM,IR and XRD to carry out the characterization on the modified bentonite,and studied the adsorption mechanism of Pb2+ on it. Regarding the isothermal experiments of organic-microwave-bentonite,it indicated that it follows the Langmuir equation and the Freundlich equation. The above findings have certain theoretical and practical significances for using the adsorption performance of bentonite to treat wastewater,especially Pb2+-containing wastewater. Simultaneously a new way to enhance the application value of bentonite in our country has been developed.

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