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研究报告

张悦,王兵,任宏洋.O₃/Mn₂O₃对钻井废水多相催化臭氧化试验研究[J].环境科学学报,2015,35(10):3185-3192**O₃/Mn₂O₃对钻井废水多相催化臭氧化试验研究****Experimental study of O₃/Mn₂O₃ heterogeneous catalytic ozonation on drilling wastewater**关键词: [Mn₂O₃催化剂](#) [钻井废水](#) [臭氧](#) [多相催化](#)基金项目: [中石油科技管理部科技开发项目"公司发展战略与科技基础工作决策支持研究"基金项目\(No.2011D-5008-01\)](#); [西南石油大学大学生开放实验基金项目\(No.KSZ13065\)](#)

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摘要: 通过静态试验,探讨了Mn₂O₃催化剂对钻井废水催化臭氧化处理效果.分别考察了催化剂加量、pH值、反应时间、反应温度和强化剂对钻井废水COD去除率的影响,通过正交试验得到了最佳工艺条件,对钻井废水氧化过程中的产物进行了分析,并探讨了Mn₂O₃催化剂的稳定性能.结果表明:Mn₂O₃加量从25 mg·L⁻¹增加到50 mg·L⁻¹时,COD去除率由43.6%增加到54.3%;pH分别为5、11时,COD去除率分别为45.4%和64.3%;反应温度为20℃时,COD去除率最高达到59.1%;随着反应时间的延长,COD去除率也随之增加,反应时间为40 min时,COD去除率达到85.3%;由正交试验得知影响因素的主次关系为催化剂加量>反应pH>反应温度>反应时间,最佳处理工艺条件为催化剂加量50 mg·L⁻¹、pH值11,反应温度25℃、反应时间35 min;在25 min时,Ca²⁺的引入使COD去除率增大了7.1%;钻井废水中的有机物得到降解和矿化;Mn₂O₃催化剂重复使用10次后,对钻井废水COD降解率影响不大,锰离子的溶出量在反应15 min后稳定在3 mg·L⁻¹.Mn₂O₃催化剂稳定性性能较好.

Abstract: By static test, the effect of catalyst Mn₂O₃ on the ozonation of drilling wastewater was investigated. The influence of the catalyst quantity, pH value, reaction time, reaction temperature and enhancer on drilling wastewater COD removal efficiency were studied. The optimum process condition was obtained by using orthogonal experiment. The products in the process of drilling wastewater oxidation and the stability of Mn₂O₃ catalyst was analyzed. The results showed that when dosage of Mn₂O₃ was increased from 25 mg·L⁻¹ to 50 mg·L⁻¹, the COD removal rate increased from 43.6% to 54.3%; When pH were 5 and 11, COD removal rate were 45.4% and 64.3% respectively. When the reaction temperature was 20℃, the highest COD removal rate reached 59.1%. With the extension of reaction time, the COD removal rate was increased. And when the reaction time was 40 min, the COD removal rate reached 85.3%. The significance of influence factors analyzed by orthogonal experiment was in the following order: catalyst dosage > pH > reaction temperature > reaction time, and the optimum conditions were catalyst dosage 50 mg·L⁻¹, pH 11, reaction temperature 25℃, reaction time 35 min. At the time of 25 min, COD removal rate increased 7.1% by the introduction of Ca²⁺. The degradation and mineralization of the organic matter in drilling wastewater can be achieved. Mn₂O₃ catalyst after reuse ten times did not have obvious affect on the degradation rate of the drilling wastewater COD. The dissolubility dosage of manganese ion was 3 mg·L⁻¹ after 15 min. The performance of Mn₂O₃ catalyst is stable.

Key words: [Mn₂O₃ catalyst](#) [drilling wastewater](#) [ozone](#) [heterogeneous catalytic](#)

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