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麻疯树油制备生物柴油中SO_4^{2-}/TiO_2固体酸研究

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Study on sulfated titania in preparing biodiesel with *Jatropha curcas* L. oil

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摘要 利用高酸值麻疯树油中游离脂肪酸与甲醇酯化反应作为目标反应,通过直接煅烧工业原料偏钛酸,制得高酯化活性的ST固体酸.系统地研究了制备条件、反应条件对其酯化活性的影响.ST固体酸制备过程中,煅烧温度是一个敏感的因素,而煅烧时间影响较小.最佳的制备条件为:500℃,2h.最佳的反应条件为:反应温度为90℃,醇酸摩尔比为20:1,催化剂用量为油重的4%,反应时间为2h.在此条件下,游离脂肪酸的转化率可达97%以上.FTIR研究、S质量分数测定表明:活性组分溶剂化流失、表面积炭为其失活的主要原因.再硫化或在氧气中煅烧是较为有效的再生方法.

关键词: SO_4^{2-}/TiO_2 生物柴油 麻疯树油 酯化反应

Abstract: ST(SO_4^{2-}/TiO_2) solid acid was prepared by direct calcination of industrial metatitanic acid.The ST solid acid showed a high catalyst activity for the esterification of methanol and free fatty acid in *Jatropha curcas* L.seed oil with high acid value.The effects of various conditions of preparation of ST solid acid on its activity were investigated.Calcination temperature is a vital factor and calcination duration is a subsidiary factor in preparation of ST solid acid.The optimum condtition was 2 hrs at 500 ℃.The optimum conditions for the esterification were 2 hrs at 90 ℃,4% solid acid and 20:1 methanol to FFA.Under these conditions,the conversion of FFA was higher than 97%.It was indicated by FTIR and S determination of ST solid acid that the deactivity of the catalyst was mainly caused by the loss of active species in polar solvent and surface coking.Resulfuration and calcinations in oxygen may be an effective way to regenerate the activity of ST solid acid.

Key words: sulfated titania biodiesel *Jatropha curcas* L.seed oil esterification

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