



改善棉子油生物柴油低温流动性的研究

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Study on Cold Flow Properties of Biodiesel Derived from Cottonseed Oil

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摘要

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摘要 使用气-质联用仪分析棉子油生物柴油的组成, 运用低温性能测试仪和生物柴油的结晶机理研究CME的低温流动性, 提出了改善CME低温流动性的三种措施: 结晶分馏, 与低温石油柴油调和, 或添加低温流动性改进剂。建立了基于CME调和比例的冷滤点预测模型。研究表明: CME主要由脂肪酸甲酯($C_{14:0} \sim C_{24:0}$, $C_{16:1} \sim C_{22:1}$, $C_{18:2}$ 和 $C_{18:3}$)组成, 其中饱和脂肪酸甲酯(SFAME)和不饱和脂肪酸甲酯(UFAME)的质量分数分别为32.12%和66.19%, 冷滤点为6℃。结晶分馏, 冷滤点降到-1℃; 与-10号柴油(-10PD)调和, 冷滤点最低可降到-12℃; 在Flow Fit, Flow Fit K和T818的体积分数均不超过1.5%时, CME及CME与-10PD的调和油(CME/-10PD)的冷滤点分别最低降到0℃和-26℃。

关键词: 生物柴油 低温流动性 结晶 气相色谱-质谱

Abstract: The chemical compositions of biodiesel derived from cottonseed oil(CME) were analyzed by GC-MS. The cold flow properties of CME were studied by cold filter plugging point tester and crystallization mechanism of biodiesel, three approaches for improving cold flow properties of CME were put forward: (i) crystallization fractionation; (ii) blending with winter petrodiesel; and (iii) treating with cold flow improver additives. A good correlation model was proposed for predicting cold filter plugging point(CFPP) by CME blending ratio. The study shows that the CME is mainly composed of saturated fatty acid methyl esters ($C_{14:0} \sim C_{24:0}$) and unsaturated fatty acid methyl esters ($C_{16:1} \sim C_{22:1}$, $C_{18:2}$ and $C_{18:3}$). The mass fraction of SFAME and UFAME is 32.12% and 66.19%, respectively. The CFPP of CME is 6℃. Crystallization fractionation and blending with -10PD decreased the CFPP of CME to -1℃ and -12℃, respectively. Adding not more than 1.5%(volume fraction) of Flow Fit, Flow Fit K and T818 additives decreased the CFPP of CME and CME/-10PD to 0℃ and -26℃, respectively. This study has effectively improved cold flow properties of CME and provides technical support for using CME.

Keywords: biodiesel cold flow properties crystallization GC-MS

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