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Desulfurization of Gasoline by Condensation of Thiophenes with Formaldehyde in a Biphasic System Using Aqueous Phase of Acids[#]

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Abstract Aqueous phase of acids as catalysts for the desulfurization of gasoline by condensation of thiophenes with formaldehyde in a biphasic system were investigated. Two types of model gasoline with and without aromatics and olefins were employed in this work. The desulfurization rates were above 90 % on these two types of model gasoline using formic acid and $H_3PW_{12}O_{40}$ (0.8 mol·L^{-1}), indicating that the presence of aromatics and olefins have no effect on the desulfurization rate. High temperature (above 90 ^oC) was more favorable to the process for desulfurization. Four hours was considered to be the proper treating time for the sulfur removal. In addition, aqueous phase of acids could be recycled at least 4 times without decreasing desulfurization rate. Finally, the possible process for the integration of condensation desulfurization into the existing refinery process for the production of gasoline with low sulfur content was proposed.

Keywords desulfurization, condensation, acid, thiophene

1 INTRODUCTION

Sulfur that is present in transportation fuels leads to sulfur oxide (SO_x) emissions into the air and inhibits the performance of pollution control equipment on vehicles [1-4]. Therefore, to minimize the negative health and environmental effects from automobile exhaust, many countries recently have mandated a reduction in the sulfur content in motor fuel and increasingly severe regulations are being imposed to reduce the S-content to a very low level such as (10-20)×10^{-6} [5]. Consequently, the deep desulfurization of motor fuels has attracted increased attention in the research community worldwide.

In the petroleum industry, low-sulfur fuels are often obtained from hydrocracking processes or hydrotreating processes [6]. Although hydrotreating processes have been highly effective for

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