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Synthesis, Characterization, and Application of Novel Trihexyltetradecyl Phosphonium Chloride for Extractive Desulfurization of Liquid Fuel

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Abstract : Owing to the stringent environmental regulations in many countries for production of ultra low sulfur petroleum fractions intending to reduce sulfur emissions results in enormous interest in this area among the scientific community. The requirement of zero sulfur emissions enhances the prominence for more advanced techniques in desulfurization. Desulfurization by extraction is a promising approach having several advantages over conventional hydrodesulphurization. Present work is dealt with various new approaches for desulfurization of ultra clean gasoline, diesel and other liquid fuels by extraction with ionic liquids. In present paper experimental data on extractive desulfurization of liquid fuel using trihexyl tetradecyl phosphonium chloride has been presented. The FTIR, 1H-NMR, and 13C-NMR have been discussed for the molecular confirmation of synthesized ionic liquid. Further, conductivity, solubility, and viscosity analysis of ionic liquids were carried out. The effects of reaction time, reaction temperature, sulfur compounds, ultrasonication, and recycling of ionic liquid without regeneration on removal of dibenzothiphene from liquid fuel were also investigated. In extractive desulfurization process, the removal of dibenzothiophene in n-dodecane was 84.5% for mass ratio of 1:1 in 30 min at 30OC under the mild reaction conditions. Phosphonium ionic liquids could be reused five times without a significant decrease in activity. Also, the desulfurization of real fuels, multistage extraction was examined. The data and results provided in present paper explore the significant insights of phosphonium based ionic liquids as novel extractant for extractive desulfurization of liquid fuels.

Keywords : ionic liquid, PPIL, desulfurization, liquid fuel, extraction
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