INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE
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CANDIDATE'S DECLARATION

I hereby declare that the work which is being presented by me in this dissertation report entitled "**OXIDATIVE-EXTRACTIVE DESULFURIZATION OF LIQUID FUELS USING IONIC LIQUID"** in partial fulfilment of the requirements for the award of the degree of **MASTER OF TECHNOLOGY** in **CHEMICAL ENGINEERING** with specialization in "Industrial Pollution Abatement" submitted to the Department of Chemical Engineering, Indian Institute of Technology Roorkee, is an authentic record of my own work carried out under the supervision of **Dr. Vimal Chandra Srivastava**, Associate Professor, Department of Chemical Engineering, Indian Institute of Technology Roorkee, Roorkee, India.

The matter presented in this report has not been submitted by me for the award of any other degree of this or any other institute.

Date:
Place: Roorkee

SUDEEP SINGH
Enrollment No. - 12515025

CERTIFICATE

This is to certify that the above statement made by the candidate is correct to the best of my belief and knowledge.

Dr. Vimal Chandra Srivastava
Associate Professor
Department of Chemical Engineering
Indian Institute of Technology Roorkee,
Roorkee Uttrakhand -247667.

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Sudeep Singh
Enrollment No.
12515025

ABSTRACT

The present work aims to remove sulfur from liquid fuel using oxidative-extractive desulfurization (OEDS) using a coordinated ionic liquid. In the present study, ionic liquid was prepared by coordination of di-methyl sulfoxide (DMSO) with $ZnCl_2$. Dibenzothiophene (DBT) dissolved in iso-octane was used as synthetic model liquid fuel. In addition, actual diesel was also used for comparative studies. Oxidation in the OEDS process was achieved by adding hydrogen peroxide and acetic acid to the mixture. Amount of DBT in the model oil was determined by using gas chromatograph equipped with flame ionization detector whereas total sulfur in the actual diesel was estimated using NEX-QC X-ray fluorescence (XRF) analyzer.

Different parameters such as oil to ionic liquid ratio, oxidant to sulfur ratio and temperature were optimized. Kinetic study was performed for different temperatures which were used to calculate the reaction rate constants. Optimized conditions were also tested for their applicability on actual diesel. At the optimized conditions (oxidant to sulfur ratio=6, oil to ionic liquid ratio=3 and temperature=30^{o}C), 78% sulfur removal was observed from model oil (initial sulfur concentration=1000 mg/l) and 65 % sulfur removal was observed for actual diesel oil (initial sulfur concentration=140 mg/l).

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