

# Upgradation of Middle Distillate Streams via Extractive Oxidative Desulfurization Methods †

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**Abstract:** Nowadays, the environment is polluted by the emission of gases from transportation fuels and contributes to increasing global warming. These gases have adverse effects on human health due to deep penetration into the human lungs, which causes various respiratory problems. Therefore, to overcome the health and environmental effect, emissions of automotive exhaust gases such as sulfur concentration in motor fuels should be reduced. The current limit of sulfur in diesel is a maximum of 10 ppm. Thus, the production of such types of ultra-low-sulfur fuels has a high impact on refinery economics. Thus, efficiency becomes a vital point of desulfurization technologies. The main refractory sulfur compounds present in the fuels are benzothiophene, dibenzothiophene, and alkylated dibenzothiophenes.

Current conventional hydrodesulfurization processes cannot generate such a low level of sulfur fuels. It requires high hydrogen pressure (30-130 atm) and high temperature (300-400°C). Thus, it increases their capital cost. Also, it cannot remove these refractory sulfur compounds present in the diesel. Hence, alternative desulfurization is now gaining interest in the researcher's focus, which can be initially processed under room conditions. Another alternative method for desulfurization is the extractive oxidative desulfurization of fuels which involves selective oxidation of fuels followed by extraction with the polar solvents. Various oxidant and catalysts combinations were used for the oxidation of fuels. The best combination was found in hydrogen peroxide and the formic acid system. The oxidized fuel was further extracted using different polar solvents such as acetonitrile, N-methyl pyrrolidone, ionic liquids, and deep eutectic solvents.

**Keywords:** Desulfurization Methods; acetonitrile; N-methyl pyrrolidone; ionic liquids (List three to ten pertinent keywords specific to the article; yet reasonably common within the subject discipline.)

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## **Conflicts of Interest**

The authors declare no conflict of interest.