Oxidative Desulfurization of Diesel Fuels with Hydrogen Peroxide in the Presence of Activated Carbon and Formic Acid

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The object of the research in the given work is oil Krapivinskogo deposits. Further a method of oxidation is considered. We receive diesel fraction where deleted sulphur is. The aim of this method is applications of the activated carbon in the combination of peroxide of hydrogen and formic acid. The result of our work is desulfurization of the diesel fraction [1].

The purpose of the work consisted in conducting the experiment with oxidative desulfurization (ODS) of diesel fuels with new extragents.

It is necessary to mention the experiment carrying out oxidative desulfurization of commercial diesel oil. A mixture of a commercial diesel oil (100 mL), 30 wt % hydrogen peroxide (3 mL), H2O (5 mL), formic acid (4 mL), and W101 (0,7 g) was stirred at 750 rpm in a 250-mL, three-necked flask at 60 °C for 60 min. The flask was fitted with a condenser, a mechanical stirrer, and a thermometer. After the completion of the reaction, the oxidized oil, which was separated from the reaction mixture, was washed with an aqueous solution of sodium carbonate (5 wt %, 50 mL 2), and then dried over anhydrous sodium sulfate. Adsorption of the sulfur compounds remained in the oil after drying was performed in a glass flask with a stirrer.

The oxidized oil (97,8 mL) and adsorbent (1,5 g of W101, 20 g of Al2O3) were mixed at room temperature for 12 h, and then the oil and adsorbent were separated by filtration”[2].

Sulfur contents after oxidation of the commercial diesel oil using different ODS systems have been summarized in the table 1:

Table 1. Sulfur contents after oxidation of commercial diesel oil using different oxidative desulfurization systems

<table>
<thead>
<tr>
<th>catalyst</th>
<th>formic acid concentration (mol/L)</th>
<th>residual sulfur in the oxidized oils (ppm)</th>
<th>sulfur removal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>formic acid</td>
<td>19,9</td>
<td>447</td>
<td>44,1</td>
</tr>
<tr>
<td>formic acid</td>
<td>8,8</td>
<td>626</td>
<td>21,8</td>
</tr>
</tbody>
</table>

The results in the table 1 indicate that the residual sulfur content of the oxidized diesel oil in the reaction system that contains W101 and formic acid is much lower than the system that has only formic acid [3].
Picture 1. Exit of a ready product after extraction at miscellaneous parity.

The exit of sulphur after extraction at three parities: one: one, two: one, three: one. The volume extragents have always increased, and the volume of diesel fraction has remained invariable. From the schedule it is visible that at addition extragents the sulphur exit decreased.

Picture 2. Final maintenance of sulphur in diesel fraction after desulfurization is shown.

From the diagramme it is visible that the more extragents the less sulphur concentration in diesel fraction.

The removal of dibenzothiophene (DBT) from n-octane and oxidative desulfurization (ODS) from commercial diesel oil with hydrogen peroxide have been investigated using activated carbons such as the catalyst, and the following results have been obtained:

1. The higher the adsorption capacity of the activated carbons for DBT, the higher the catalytic performance in the oxidation of DBT.
2. The introduction of formic acid enhances the oxidative removal of DBT when the activated carbons act as the catalysts.
3. Activated carbon has high catalytic activity for the oxidative treatment of diesel fuels and can be used repeatedly.

References