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SOLVENT EXTRACTION OF LUBRICATING OILS

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This invention relates to the solvent extraction of mineral oils, especially the lubricating fractions of petroleum, and is more particularly concerned with certain improvements by means of which the yield of desired high quality oil may be increased.

It is well know that lubricating oils may be separated into their respectively more paraffinic and more aromatic fractions by means of selective solvents such as phenol, furfural, nitrobenzene, beta betadichlorethyl ether, liquid sulfur dioxide, etc., which have the property of selectively dissolving the more aromatic constituents and leaving the paraffinic fractions substantially undissolved. In most cases the selectivity of these solvents between paraffinic and aromatic fractions is not absolutely sharp so that some of the desired paraffinic hydrocarbons are carried out with the aromatic fractions into the extract. It is of course desirable wherever possible to recover as much of the high quality paraffinic fractions from the extract as possible.

The present invention is directed primarily to the recovery of high quality oil carried out in the extract phase during solvent extraction. For purposes of description but not of limitation, solvent extraction with phenol as the selective solvent will be considered.

Various means are now known for recovering high quality oil or so-called "cycle oil" from the extract phase. In a continuous extraction process this cycle oil after separation from the extract is returned to the solvent extraction with the fresh oil. One method is to add water, phenolic water, methyl alcohol, polyhydric alcohols, or acetonitrile to the extract phase whereby a separation into two layers is effected, the upper layer containing the higher quality fractions of the original extract phase. Another method is to cool the extract phase whereby a similar separation into layers occurs. Still another method is to add a solvent modifying agent to the extract phase whereby the solvent capacity is changed and a separation into layers occurs. Examples of this type of modifying agent are liquefied normally gaseous hydrocarbons such as ethane, propane and butane or mixtures of these.

Heretofore each of the methods has been considered to be interchangeable with the other. One of the three methods would be selected as being adequate.

It has now been found that there is a distinct difference in the character of the cycle oil obtained by using water on the one hand and propane on the other as the modifying agent. When water or a similar agent is used, the cycle oil has a higher viscosity and a higher carbon content than the fresh oil charge, and the separation is principally according to chemical structure, the cycle oil containing the higher V. I. material. On the other hand, when propane or a similar agent is used, the cycle oil has lower viscosity, lower carbon content and better color than the charge stock but the separation is principally according to molecular weight so that some of the high viscosity, high V. I. oil remains in the extract phase.

According to the present invention, it is proposed to use both methods of cycle oil recovery so that the disadvantages of one method may be offset or compensated for by the advantages of the other. The method of carrying out the invention will be fully understood from the following description:

The lubricating oil is first extracted in the conventional countercurrent manner in a tower with phenol. Raffinate is removed from the top of the tower and extract from the bottom. The extract phase is removed to a separate chamber wherein from 5 to about 10% of water is added to it. Following the addition of water, propane is added to the mixture in quantities from ½ to about 4 volumes of propane to 1 volume of extract-water mixture. The mixture is then allowed to stand and separates into two layers. The bottom layer is discarded. The upper layer consisting of cycle oil is removed and the propane stripped off by evaporation or distillation. The propane-free cycle oil still containing phenol is then returned to the extraction tower with the fresh charge oil.

It will be understood that the process may be carried out equally well in the conventional batch manner.

It will be seen from the above description that the present improved method of recovering cycle oil consists essentially in the addition to the extract phase of two different types of modifying agent. One type is such that it effects a separation principally according to chemical structure and the other type is such that it effects separation principally according to molecular weight. The result of using both types of modifying agent is that a greater yield of higher quality oil is recovered from the extract than would be possible if either type of agent alone were used.

This invention is not limited by any theories of the mechanism of the reactions nor by any details which have been given merely for pur-

poses of illustration, but is limited only in and by the following claims in which it is intended to claim all novelty inherent in the invention.

I claim:

1. In the extraction of lubricating oils with phenol whereby the oil is separated into a raffinate phase and an extract phase, the improved method of recovering valuable fractions carried out in the extract phase which comprises first adding to the extract from 5 to 10% of a substance selected from the class consisting of water, phenolic water, methyl alcohol, and polyhydric alcohols, then adding to this mixture prior to removal of separated oil from ½ to 4 volumes of a liquefied normally gaseous hydrocarbon, allowing the mixture to stand whereby two layers are formed, separating the upper layer and removing the liquefied hydrocarbon therefrom.

2. Process according to claim 1 in which from 5 to 10% of water is first added to the extract and then from ½ to 4 volumes of propane are added prior to removal of separated oil.

3. Process for obtaining increased yields of high quality oil from the lubricating fraction of petroleum which comprises extracting the lubricating fraction with a solvent having preferential selectivity for aromatic hydrocarbons, separating the raffinate from the extract, adding to the extract from 5 to 10% of a substance selected from the class consisting of water, phenolic water, methyl alcohol, and polyhydric alcohols, then adding to this mixture prior to removal of separated oil from ½ to 4 volumes of a liquefied normally gaseous hydrocarbon, separating the two layers into which the extract is thereby divided, and returning the upper of the two layers to the solvent extraction step.

4. Process for obtaining increased yields of high quality oil from the lubricating fraction of petroleum which comprises extracting the lubricating fraction with a solvent having preferential selectivity for aromatic hydrocarbons, separating the raffinate from the extract, adding to the extract a substantial amount up to 10% of a substance selected from the class consisting of water, methyl alcohol, phenolic water and polyhydric alcohols, then adding to this mixture a substantial amount of a liquefied normally gaseous hydrocarbon, separating the two layers into which the extract is thereby divided whereby an upper layer is obtained having an increased yield of higher quality oil, and returning the upper of the two layers to the solvent extraction stage.

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