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DESULPHURIZING HYDROCARBON OILS

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5 Claims. (Cl. 196—26)

The present invention relates to desulphurizing hydrocarbon oils and, particularly petroleum distillates such as gasoline, kerosene and gas oil and petroleum distillates which contain gasoline, kerosene and gas oil fractions.

According to the present invention, metals which have a strong affinity for sulphur are brought into highly dispersed condition in the oil to be desulphurized and the oil is then heated to a suitable temperature at which said metals react with the sulphur content of the oil to a substantial degree.

Among the metals which are suitable for this purpose are the alkali metals and particularly sodium and potassium.

In actual practice, we prefer to employ sodium on account of its cheapness and effectiveness.

In practice, we prefer to subject the oil containing the highly dispersed metal to heating for a substantial time, for example, two to four hours, more or less, at temperatures between 350 to 650° F. It must be understood that the invention is not intended to be limited to the periods or temperatures set forth, since the reaction will take place at higher and lower temperatures and the time may be varied in accordance with the temperature employed and, also, the extent of desulphurizing which it is desired to obtain.

Another factor which has considerable influence upon the rapidity of the reaction and the completeness of the sulphur removal is the amount of metal which is employed. It is found that a substantial excess of the metal gives much more complete removal of sulphur than does a smaller amount of metal under the same conditions. We prefer to employ the metal to the extent of between one and two equivalents of the sulphur content and to control the temperature to give the desired amount of desulphurization. It will be understood that smaller amounts of metal may be employed where a lesser degree of sulphur removal is desired.

In the case of low boiling distillates which are to be heated above the temperature at which at least a part of the oil vaporizes, the heat treatment should be effected under pressure in order to insure effective treatment.

The invention will be readily understood from the following specific examples.

Example I

Winkler gas oil of a boiling range between 500 and 675° F. and containing 1.18% of sulphur is passed through a colloid mill of which the plates are set at .002 inches clearance, together with molten sodium in the requisite quantity. In this way, the sodium is brought into a highly dispersed state of very permanent character. This oil is heated in a batch still for three hours and thereafter the sodium sulphide is permitted to settle and the distillate drawn off. As indicated above, pressure is maintained, where necessary, to prevent the liquid boiling off. The following table gives the sulphur content at various temperatures and with various amounts of sodium.

Temp. °F.	1.5 equivalents of sodium	2 equivalents of sodium	2½ equivalents of sodium	3 equivalents of sodium
650	0.249	0.159	0.085	
550	0.428	1.110	0.007	
350				0.116

Example II

Lander gas oil containing 1.804% of sulphur was treated with sodium in the same way and the results are given in the table below.

Temperature	1 equivalent of sodium	1.5 equivalents of sodium	2 equivalents of sodium
450	.760	.250	.390
550	1.380	.150	.029
650	.779	.125	.258

Although the present invention has been described in connection with the details of specific examples thereof, it is not intended that such details shall be regarded as limitations upon the scope of the invention, except in so far as included in the accompanying claims.

We claim:

1. The method of desulphurizing petroleum distillates while in a liquid state which consists in passing the distillate and molten alkali metal through a colloid mill to disperse the alkali metal therethrough in the form of a colloidal suspension, heating the distillate to cause the alkali metal to react with the sulphur contained in said distillate, and separating the alkali metal sulphide from the treated oil.

2. The method of substantially desulphurizing petroleum oil distillates while in a liquid state which consists in passing the distillate through a colloid mill, together with molten sodium, thereby dispersing the sodium in the oil in a finely divided colloidal condition, heating the distillate while in the liquid state to cause the colloidal sodium to react with the sulphur contained

in the oil, and separating the sodium sulphide from said treated oil.

3. The method of desulphurizing petroleum distillates while in a liquid state which consists in passing the liquid distillate together with molten alkali metal through a colloid mill to disperse the alkali metal therethrough in a highly dispersed state, heating the distillate to between 350 and 650° F. for sufficient time to cause a substantial part of the sulphur contained in the distillate to combine with the dispersed alkali metal, and separating the alkali metal sulphide from the treated oil.

4. The method of desulphurizing petroleum distillates while in a liquid state, which consists in passing the distillate together with molten sodium through a colloid mill to disperse the sodium therethrough in a highly dispersed state, the amount of sodium being from 1½ to 3 times the equivalent of the sulphur in the distillate, heating the distillate to between 350 and 650° F. for sufficient time to cause a substantial part of the sulphur contained in the distillate to combine with the sodium, maintaining sufficient pressure upon the distillate during the heating thereof to maintain said distillate in a liquid state, and then separating the sodium sulphide from the treated distillate.

5. The method of desulphurizing gas oil while in the liquid phase, which consists in passing said oil through a colloid mill together with a molten alkali metal, thereby dispersing the alkali metal therethrough in a highly dispersed state, heating the oil to cause the alkali metal to react with the sulphur in said oil, and separating the solid reaction products and residue from the treated oil.

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