[Second Edition.]

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

2940

Process for Improving Lubricating Oils.

We, RUHRCHEMIE AKTIENGESELLSCHAFT, of Oberhausen-Holten, Germany, a Company organised and existing under the laws of the German State, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

The invention consists in an improvement in or modification of the invention described and claimed in the Specification of the Applications Nos. 19657 and 19658 of 1935 (Serial No. 464,393) which relates to the improvement of lubricating oils and to raising of the viscosity of benzines, gas oils and oils from brown-coal tar as also the viscosity of liquid hydrocarbons secured by hydrogenation or of hydrocarbons resembling benzine obtained by the conversion at normal pressure of carbon monoxide with hydrogen. This result is attained by adding products that are secured in a simple manner by the treatment of gases containing propylene and ethylene with polymerization and condensation catalysts such as aluminium chloride, iron chloride, zinc chloride, boron fluoride at temperatures lying below 0° C. Reaction accelerating substances such as mercuric chloride, or reaction retarding substances, such as aluminium oxide or zinc oxide, may be added.

In a modification of the process according to the invention of the specifications quoted it has been found that the practical improvements secured by the said process may be secured with products that are obtained in a simple manner by the polymerization of gases containing propylene but no ethylene. The reaction on the propylene may take place in the presence of diluting gases or on the practically pure compound.

The propylene to be polymerised may be obtained from industrial gases.

The possibility of improving lubricating oils with the polymerization products from gases that do not contain ethylene, allows the large quantities of ethylene to be applied to other purposes, such as the production of ethyl alcohol, ethylene oxide and the like.

The reaction of the catalysts hereinbefore mentioned may take place as in the main process at normal pressure or at a raised pressure. The polymerization of the propylene which is present in a pure or dilute form may take place in the presence of the mixtures of hydrocarbons to be improved. If no pressure is being employed it is preferable in this case to make use of a return-flow cooler, cooled to a low temperature. The improvement of the lubricating oils may be effected by stirring vigorously during the polymerisation of the propylene throughout the entire reaction, the reaction mixture being if desired heated to normal temperature after the main reaction has ceased.

In all cases it is important that the content of water contained in the gases employed for acting on the catalysts should be maintained as low as possible, as otherwise the catalysts become spent too soon. Drying may be effected in the manner indicated for the main process.

The subjoined table indicates the improvements which are obtained by adding a propylene polymerization product to commercial refrigerator oil. The figures show that the viscosity of the oil is considerably improved by the addition and that a lubricating oil is produced the degree of viscostity of which is dependent in smaller measure on the temperature. With an addition of 40% of a propylene polymerization product the solidification point is −39° C., and is thus excellent even with this large addition. The improvement in the qualities of the lubricating oil is also shown by the greater resistance to oxidation of the lubricating oil thus produced. The "tarification" coefficients drop from 0.43 to zero, the Sligh test (ASTM) shows a drop from 1.53 to zero. The coking coefficient falls in the case of pure refrigerator oil from 102 to 36.2 in the case of a 40% addition of a propylene polymerization product. The term "viscosity pole height" has the meaning that is attached to it by Prof. Dr. L. Ubbelohde

in his work "Zur Viskosimetrie," published by Mineralölforschung, of Berlin, W.8. The greater the pole height of a series of oils the greater is the dependence of the viscosity on temperature and the less valueable is the oil. The best American oils have a pole height of 1.9, Russian oils, for example, 2.6 to 2.7 and very poor oils 3.7

TABLE.

Experiments conducted on a refrigerator oil and its mixtures with a propylene polymerization product.

	Refrigerator oil.	Refrigerator oil + 10% polymerization product.	Refrigerator oil + 20% polymerization product.	Refrigerator oil + 30% polymerization product.	Refrigerator oil + 40% polymerization product.
Specific gravity					
at 20° C.	0.8924	0.8900	0.8880	0.8860	0.8825
at 50° C.	0.8699	0.8670	0.8658	0.8650	0.8633
Viscosity in centipoises					
at 20° C.	28.5	33.7	39.4	48.9	103.0
at 50° C.	7.9	8.97	10.13	11.77	20.38
Viscosity in degrees Engler					
at 20° C.	4.34	5.11	5.98	7.36	15.3
at 50° C.	1.73	1.855	1.98	2.16	3.3
Viscosity pole height	3.3	2.9	2.7	2.65	2.6
Coking coefficient	102	69	45	38	36.2
Tarification coefficient	0.43	0.25	0.10	0.0	0.0
Sligh Test (ASTM)	1.53	0.59	0.40	0.0	0.0
Solidification point	–55° C.	–50° C.	–47° C.	–43° C.	–39° C.

It has been proposed, in Specification No. 293,487, to carry out a process of polymerization of propylene and like hydrocarbons either singly or in admixture at any desired temperature such as room temperature or under, by means of boron fluoride and under pressure. In the examples no temperature lower than room temperature is specified.

Again it has been proposed, in Specification No. 358,068, to effect the polymerization of unsaturated hydrocarbons either singly or in admixture at room temperature or at higher or lower temperatures Thus, when using iso-butylene the temperature may be between –10° C. and 10° C. while in the case of propylene a higher temperature, usually room temperature, is employed if the same end product is desired. The examples relating to the polymerization of propylene do not, however, specify the use of temperatures other than room temperature.

It has also been proposed, in Specification No. 432,310, to produce highly viscose polymerization products having a molecular weight above 800 by effecting polymerization of a fraction of cracked hydrocarbons with an active halide polymerising agent at a temperature below 32° F. Generally reaction temperatures below 32° F. are preferred when semi-solid products of relatively high molecular weight are desired, while temperatures up to 100° F. may be used for the production of viscous lubricating oil.

It has also been proposed, in Specification No. 455,114, to produce polymers for addition to lubricating oils by maintaining an olefine of less than five carbon atoms

in liquid phase in intimate contact with a sulphuric acid catalyst at a temperature below –20° C.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

1. A modification of the process according to the invention of Applications Nos. 19657 and 19658 of 1935 (Serial No. 464,393) for improving lubricating oils by adding polymerization products, obtained by treating gases containing ethylene and propylene with polymerising agents such as aluminium chloride, iron chloride, zinc chloride, boron fluoride and the like if required with an addition of reaction accelerating substances or reaction retarding substances at temperatures lying below 0° C., characterised in that in place of gases containing ethylene and propylene, gases are used which contain propylene but no ethylene.

2. A method according to claim 1, characterised in that the lubricating oils to be employed are charged with polymerization products which are obtained by treating with polymerization agents propylene that has been obtained from industrial gases.

3. A method of improving lubricating oils, characterised in that the polymerization of propylene or gases containing propylene is carried out by employing catalysts such as aluminium chloride, iron chloride, zinc chloride, boron fluoride in the presence of the mixtures of hydrocarbons to be improved, at temperatures lying below 0° C., with or without the use of pressure.

4. A method according to claim 3, characterised in that lubricating oils are improved by employing during the polymerization of the propylene without pressure a return flow cooler, cooled to a low temperature.

5. A method according to claims 3 and 4, characterised in that the lubricating oils are improved by vigorously stirring during the whole reaction while polymerising the propylene, the reaction mixture being heated to normal temperature after the main reaction has ceased.

Dated this 19th day of January, 1937.
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