

UNITED STATES PATENT OFFICE

2,581,092

OLEFIN-DIOLEFIN COPOLYMERS AND
MERCAPTAN ADDUCTS

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No Drawing. Application January 2, 1948,
Serial No. 364

2 Claims. (Cl. 252-45)

1 This invention relates to the improvement in lubricating qualities of hydrocarbon oils and particularly to the improvement in pour and viscosity characteristics by blending hydrocarbon lubricating oils with certain oil-soluble products together with the process of making the same. Improved designs in internal combustion engines used in automobiles, aircraft and the extremes of temperatures of maintenance and operation have placed such heavy service demands thereon that hydrocarbon oils alone are in many cases unsuitable as lubricants. The deficiencies of hydrocarbon oils as lubricants in engines which are subjected to widely varying extremes of heat and cold have in large measure been overcome by blending therewith a variety of additive materials which serve to improve the pour properties or the viscosity index of the oil. It is the object of this invention to provide the art with hydrocarbon lubricants of improved pour and viscosity characteristics containing novel additives which serve to improve the pour and viscosity characteristics of the lubricants together with a process for preparing the same. These and other objects will appear more clearly from the detailed description and the claims which follow. It has been found that the pour and viscosity characteristics of hydrocarbon lubricants are improved if there are added thereto small amounts of copolymers of high molecular weight olefins and low molecular weight diolefins to which have been added mercaptans containing from 10 to 18 carbon atoms. Specifically it has been found that the copolymerization products of higher olefins containing 10 to 30 carbon atoms, e. g. decene and higher preferably 14 to 25 carbon atoms, e. g. tetradecene and cracked wax olefins and low molecular weight diolefins to which have been added mercaptans containing from 10 to 18 carbon atoms are particularly effective as additives for improving pour and viscosity characteristics of hydrocarbon lubricants. Amongst the olefins found to be particularly suitable are dodecene, tetradecene, hexadecene, octadecene, polypropylenes, triisobutylene, tetraisobutylene, etc. Suitable diolefins are butadiene, isoprene, 2,3-dimethyl butadiene, piperylene, and cyclopentadiene. Amongst the preferred mercaptans are mercaptans containing 10 to 16 aliphatic carbon atoms per molecule derived from Lorol alcohol, a mixture of alcohols

2 derived by hydrogenating coconut oil, tetradecyl mercaptan, hexadecyl mercaptan and mixtures thereof. The copolymerization of the olefin and the diolefin may be achieved by the use of a Friedel-Crafts catalyst, the reaction being performed in an inert solvent such as methyl chloride, ethyl chloride, etc. at a temperature of about -25 to +50° F. Products obtained in this manner have excellent yields and molecular weights on the order of 5,000-15,000 Staudinger. These materials also have some value for improving the viscosity characteristics of mineral lube oils. The above copolymer products are further condensed with mercaptans, usually by heating a solution of the copolymer in approximately twice the theoretical amount of mercaptan necessary to react with the double bonds present (based on the iodine number and with about 0.7 weight percent sulfur as the catalyst). The copolymer-mercaptan additives are usually added to the lubricating oil in minor proportions sufficient to impart the improving characteristics. The proportions usually run between about 0.05 to 5% by weight.

3 A flask fitted with a stirrer and a reflux condenser was charged with 50 grams of butadiene, 100 grams of octadecene and 500 cc. of methyl chloride. A total of 235 cc. of catalyst solution (containing 4.2 grams of aluminum chloride per 100 cc. of ethyl chloride) was added at a rate to maintain gentle refluxing. The reaction temperature may range from about -25 to about +50° F., preferably 32° to 45° F. The polymer was precipitated from the reaction mixture by pouring into isopropyl alcohol and finished by washing with isopropyl alcohol and drying in a vacuum oven at 60° C.

4 The above copolymer, having an iodine number of 79.3 was condensed with several mercaptans by heating a solution of the copolymer in twice the theoretical amount of mercaptan necessary to react with the double bonds present. 0.7% by weight sulfur was used as a catalyst. The temperature of reaction was held to about 175° C. for about 70 hours. The resulting materials were tested in Barosa 43 and Baton Rouge 442 neutral +3.5% Pennsylvania Bright Stock test oils which have ASTM pour points of +5 and +30° F., respectively, with the following results:

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ASTM pour points, °F.

Per Cent Additive	Barosa 43			Baton Rouge 442 neutral +3.5% Pennsylvania B. S.		
	¼	½	1	¼	½	1
Additive:						
Butadiene-Octadecene Copolymer	-5	0	0	+25	+25	-20
Butadiene-Octadecene Copolymer, C ₁₂ -C ₁₄ Alk-	+5	-15	-5	+30	+25	-15
phatic mercaptan from lauryl alcohol adduct						
Butadiene-Octadecene Copolymer, Tetradecyl	-5	-5	-10	+30	+15	-25
mercaptan adduct					0	-30
Butadiene-Octadecene Copolymer, Hexadecyl	-5	-5	-5	+20		-30
mercaptan adduct					+10	-30
Butadiene-Octadecene Copolymer, 50-50 mix-	-5	-5	-15	+25		
ture of C ₁₄ , C ₁₆ mercaptan adducts						

The foregoing description contains a limited number of embodiments of the present invention. It will be understood, however, that many variations are possible without departing from the spirit and scope of the invention as defined in the following claims.

We claim:

1. A product consisting essentially of an oil soluble condensation product of a copolymer of about two parts by weight of octadecene and about one part by weight of butadiene condensed with an excess of tetradecyl mercaptan, said copolymer being formed by subjecting the octadecene and the butadiene to a temperature within a range of from 32° F. to 45° F. in the presence of a Friedel-Crafts catalyst.

2. A lubricating composition comprising a major proportion of a mineral lubricating oil and a minor but pour depressing amount of an oil soluble condensation product of a copolymer of about two parts by weight of octadecene and

about one part by weight of butadiene with an excess of tetradecyl mercaptan, said copolymer being formed by subjecting the octadecene and the butadiene to a temperature within a range of 32° F. to 45° F. in the presence of a Friedel-Crafts catalyst.

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