

UNITED STATES PATENT OFFICE

2,454,828

VISCOSITY REDUCTION OF PETROLEUM
MAHOGANY SULFONATE HYDROCAR-
BON SOLUTIONSJacob Faust, Belleville, N. J., assignor to L. Sonne-
born Sons, Inc., a corporation of DelawareNo Drawing. Application July 1, 1947,
Serial No. 758,463

7 Claims. (Cl. 252—33.4)

1 Petroleum mahogany sulfonate solutions in organic solvents of the water immiscible type are used for a variety of purposes such as wetting agents, emulsifying agents and the like. Ordinary petroleum mahogany sulfonates impart to their solutions a relatively high viscosity. In some cases this high viscosity is not critical regarding the purpose for which the sulfonate solutions are to be used. There are, however, many cases in which a relatively high viscosity is undesirable or detrimental to their intended use or application. This is, for example, true in textile processing such as of wool, worsted, rayon, viscose or the like in which the various processing steps involved in the conversion of the raw materials into fibres, the formation of the fibres into threads and the weaving of the threads into fabric, require the presence of a lubricating agent having a Saybolt viscosity of below 600 and preferably below 300 seconds Saybolt at 100° F. The latter is particularly true of textile lubricants used in the processing of synthetic fibres. In the case of textile processing it is for instance desirable to have a hydrocarbon textile lubricant composition with a sulfonate content of in excess of 28% mahogany sulfonates so as to render the composition not only readily and spontaneously emulsifiable but also to make the same readily wettable or rewettable on the fibre to thereby impart to the textile material substantial self-scourability. Hydrocarbon solutions of the textile lubricant type and containing in excess of 28% of petroleum mahogany sulfonates possess, however, a viscosity far in excess of 600 seconds Saybolt at 100° F. and usually a viscosity in excess of 1000 seconds Saybolt at 100° F. For this reason it has been necessary in the past in such cases to limit the sulfonate content to a maximum of approximately 15% in order not to exceed the usable viscosity for textile material treating purposes. Another example is the use of petroleum mahogany sulfonates in the compounding of cutting oil bases in which the relatively high viscosity and tackiness imparted to the composition by the sulfonates is an undesirable aspect interfering in many respects with the proper ease of application and use.

The relatively high viscosity of petroleum mahogany sulfonates in organic solvents is normally not subject to reduction by the addition of relatively low viscous diluents or thinning agents. This requires agents of such relatively low viscosity that they interfere with the lubricating properties of the composition. Furthermore, these solvents are then of the type which easily

2 evaporate. This is particularly critical in the case of textile treating materials since the use of such thinning solvents will leave behind on the fibre upon evaporation a viscous sticky impregnated without adequate lubricating capacity on the fibre and will also interfere with the scourability of the impregnated material. On the other hand thinning with a solvent of the lubricant type diluent will not obtain the desired result as it is necessary to add so much of the diluent as to bring the sulfonate content to below that necessary for adequate emulsification or other purpose for which the composition is designed.

5 One object of the invention comprises inter alia the viscosity reduction of petroleum mahogany sulfonates in organic solvent solutions.

10 Another object of the invention comprises viscosity reduced petroleum mahogany sulfonate solutions.

15 These and further objects of the invention will appear from the following description.

A suitable petroleum mahogany sulfonate solution in an organic substantially water immiscible solvent for said sulfonate is treated with at least one member selected from the group consisting of substantially oil soluble glycols and alkylene glycol ethers in amount sufficient to thereby appreciably lower the viscosity of said solution due to the sulfonate dissolved therein and preferably reduce said viscosity by at least one-third.

20 The solvents that may be used for this purpose should not appreciably dissolve inorganic salts and should be substantially liquid at normal temperatures. Suitable solvents that may be used in the practice of the invention are, for instance, petroleum oil distillates or any fraction thereof, benzol and its homologs, naphtha, carbon tetrachloride, tetrachlorethane, chloroform, etc., and in general any aromatic or aliphatic or aryl or aralkyl hydrocarbon or hydrocarbon mixture including their halogenated derivatives of the afore-described character and nature. In many cases, particularly where the solvent is to be removed after the viscosity reducing treatment, it is desirable to have the boiling range of such solvent sufficiently low to permit removal in the customary manner, such as by distillation in vacuo or otherwise without causing thereby any decomposition of the mahogany sulfonates. In such cases it is of advantage that the boiling point be so low and preferably between 75 and 250° F. as to enable the removal of the solvent at ordinary temperatures without the necessity of resorting to vacuum distillation.

25 The petroleum mahogany sulfonate which is

subjected to the viscosity reduction is normally one derived from the acid refining, with fuming sulfuric acid, of a petroleum oil distillate stock under sulfonating conditions of acid amount and temperature in accordance with conventional refining practice. In such conventional fuming sulfuric acid refining an oil layer and acid sludge layer are formed, the former containing dissolved therein petroleum mahogany sulfonic acids collectively referred to as mahogany petroleum sulfonic acids. These are recovered from the oil layer in accordance with conventional methods in the form of solutions of these sulfonic acids or their salts (the latter being collectively termed "petroleum mahogany sulfonates") in a portion of the oil relatively tenaciously occluded by these sulfonic bodies. This occluded oil is generally referred to in the art as "retained" oil. The petroleum sulfonic acids or sulfonate oil compositions normally contain about 30 to 35% of retained oil and 65 to 70% of the petroleum mahogany sulfonic material. Depending upon the type and origin of petroleum oil distillates from which these sulfonate-oil solutions or stocks are derived they contain sulfonates of varying averaged molecular weights. For convenience therefore the sulfonate stocks are identified by their average molecular weights. Thus, a 420 or 450 sulfonate stock is a stock in which the sulfonates have an average molecular weight of 420 or 450 respectively.

The aforementioned group member materials should preferably be oil soluble, and good results are, for instance, obtained with diethylene glycol ethyl ether and preferably diethylene glycol monoethyl ether, diethylene glycol butyl ether and preferably diethylene glycol monobutyl ether. The majority of the group member agents useful in accordance with the invention are oil soluble and substantially water insoluble. There are, however, some agents that may be used in accordance with the invention which though oil soluble are also to some extent water soluble such as the glycols. Among these diethylene glycol is recommended.

Within the scope of my invention and for best results I may use from 0.5 to 5% and preferably from 1 to 3% of the viscosity reducing agent in accordance with the invention calculated by weight of sulfonates present in solution.

In the practical application of the invention, a suitable petroleum mahogany sulfonate solution in a solvent of the aforescribed character and nature is intimately contacted with one or more of the aforementioned viscosity reducing agents. The mix is preferably agitated and the treatment continued until the desired viscosity reduction is obtained which is usually achieved quite rapidly. In fact, in many cases the desired viscosity reduction is obtained once thorough intermingling of the components is procured.

The temperature of reaction is ordinarily not critical. The reaction, however, may be facilitated by increasing the temperature to, for example, a preferred temperature of from 120 to 200° F. This is particularly desirable with more heavily viscous solutions as the higher temperature will increase the fluidity of the solution, thus permitting more intimate contact between the reactants.

The extent to which low viscosity values may be obtained depends, at least to some extent, upon the type or origin of the petroleum mahogany sulfonate selected for the treatment. Ordinarily higher average molecular weight sulfonates pos-

sess a higher viscosity and the resulting viscosity after treatment is usually commensurately higher than the viscosity after treatment of a comparative sulfonate hydrocarbon solution which before treatment possessed a relatively lower viscosity and in which the sulfonate had a lesser average molecular weight.

The ratio of petroleum mahogany sulfonate to solvent is, as a rule, not critical except that it is desirable to so adjust the ratio that the viscosity of the solution is sufficiently low at the desired or selected temperature of treatment to permit the intimate contact between the reactants. In most cases, however, a ratio of mahogany sulfonate to solvent of substantially 2 to 1 (by weight) will give satisfactory results. Sulfonate concentrations above 70 to 75% sulfonate content are normally not desirable for direct reaction without suitable extension. As a mode of agitation, any conventional method such as stirring, air-blowing, shaking, etc. may be used.

As above pointed out, the viscosity reducing treatment in accordance with the invention may be carried out with an organic solvent solution containing relatively high concentrations of petroleum mahogany sulfonate. In this case the resultant product is a concentrate which in many cases must be thereafter adjusted by the addition of organic solvent material of suitable viscosity, such as a suitable lubricant hydrocarbon, to the requisite petroleum mahogany sulfonate content desired for the specific purpose for which the composition is to be used. Thus, for instance, if it is desired to ultimately produce a textile treating oil having in excess of 28% petroleum mahogany sulfonate and a viscosity of less than 600 seconds Saybolt at 100° F., a concentrate having in excess of 40% and usually between 60 and 65% sulfonate, is first obtained after the viscosity reducing treatment in accordance with the invention, which product may be then extended by the addition of a suitable lubricant hydrocarbon such as a mineral pale oil having a viscosity of 75 seconds Saybolt at 100° F. to a sulfonate content between 28 and 40% and a viscosity below 600 seconds Saybolt at 100° F.

Alternatively, the viscosity reducing treatment may be carried out with an organic solvent solution of a petroleum mahogany sulfonate already possessing the requisite final sulfonate content desired and intended for the purpose for which the viscosity reduced product is to be used. In that case it is also of advantage to select for the solution such solvent as is desired for the final product, i. e., if a textile lubricating oil is intended to be ultimately obtained a textile lubricant, having, for instance, a viscosity between 40 and 150 seconds Saybolt at 100° F. is selected as the solvent for the sulfonate. The product resulting from the viscosity reducing treatment is then per se usable after such further refining or purification as may be required for a textile treating oil.

Though in the operation of the novel viscosity reducing process any of the aforementioned solvents may be used with advantage, I prefer to use as the solvent that hydrocarbon fraction, the acid refining of which furnished the crude mahogany sulfonate stock and which is carried as "retained" oil. The crude mahogany sulfonate-retained oil stock constitutes as such a convenient mahogany sulfonate solution that may be subjected directly to treatment in accordance with the invention.

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The following examples are furnished by way of illustration and not of limitation.

Example I

100 lbs. of a petroleum mahogany sulfonate stock (sodium sulfonates) containing about 62% sulfonate and about 38% "retained" oil was used. The stock was obtained from a Gulf Coast distillate subjected to conventional fuming sulfuric acid refining under sulfonating conditions. The mahogany sulfonates in the stock possessed an average molecular weight of 450. The stock possessed a furol viscosity of 140 at 210° F. and upon extension with a mineral pale oil (75 seconds Saybolt at 100° F.) to a 30% sulfonate content, a viscosity of 2150 seconds Saybolt at 100° F.

About 3 lbs. of ethylene glycol monoethyl ether was intimately mixed with the non-extended sulfonate stock at a temperature for the stock of about 180° F. The stock was agitated while the glycol ether was added and agitation was continued until a sample exhibited a furol viscosity of 34 seconds at 210° F. Upon extension to a 30% sulfonate content with the aforementioned 75 vis. mineral pale oil a viscosity of 425 seconds Saybolt at 100° F. was noted.

Example II

100 lbs. of the same 450 (140 furol at 210° F.) stock used in Example I was admixed with about 3 lbs. of ethylene glycol monophenyl ether following the procedure outlined in Example I. Agitation was continued until a sample exhibited a furol viscosity of 32 seconds at 210° F. Upon extension to a 30% sulfonate content with the 75 vis. mineral pale oil specified in Example I, a viscosity of 415 seconds Saybolt at 100° F. was noted.

Example III

100 lbs. of the same 450 sulfonate stock (140 furol at 210° F.) specified in Examples I and II was admixed and treated in the manner specified in these examples with about 3 lbs. of diethylene glycol monoethyl ether. Agitation was continued until a sample exhibited a furol viscosity of 40 seconds at 210° F. Upon extension to a 30% sulfonate content with the 75 vis. mineral pale oil specified in Example I a viscosity of 450 seconds Saybolt at 100° F. was noted.

The foregoing description is for purposes of illustration and not of limitation and it is therefore my intention that the invention be limited only by the appended claims of their equivalents wherein I have endeavored to claim broadly all inherent novelty.

I claim:

1. A viscosity reduced petroleum mahogany sulfonate solution which essentially consists of a petroleum mahogany sodium sulfonate solution in an organic substantially water immiscible solvent for said sulfonate having normally a relatively high viscosity due to said sulfonate dissolved therein of in excess of 600 seconds Saybolt at 100° F. for a sulfonate content of at least 28%, and, substantially dissolved in said solution 0.5 to 5% of at least one member selected from the group consisting of substantially oil soluble diethylene glycol and diethylene glycol alkyl ethers.

2. A viscosity reduced petroleum mahogany sulfonate solution in accordance with claim 1 in

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which said group member is monoethyl ether of diethylene glycol.

3. A viscosity reduced petroleum mahogany sulfonate solution in accordance with claim 1 in which said group member is butyl ether of diethylene glycol.

4. A viscosity reduced petroleum mahogany sulfonate solution in accordance with claim 1 in which said organic solvent is "retained" oil.

5. A viscosity reduced petroleum mahogany sodium sulfonate solution which essentially consists of a solution of in excess of 28% petroleum mahogany sodium sulfonate in a solvent for said sulfonate of the petroleum hydrocarbon type having a viscosity substantially between 40 and 150 seconds Saybolt at 100° F., said solution having normally a viscosity appreciably in excess of 600 seconds Saybolt at 100° F. due to said sulfonate dissolved therein, and, substantially dissolved in said solution, 0.5 to 5% of at least one member selected from the group consisting of substantially oil soluble diethylene glycol and diethylene glycol alkyl ethers and being in amount sufficient to reduce said viscosity appreciably in excess of 600 seconds Saybolt at 100° F. to a point sufficiently low to yield for a sulfonate content in excess of 28%, a viscosity below 600 seconds Saybolt at 100° F.

6. A viscosity reduced petroleum mahogany sulfonate solution which essentially consists of a solution of in excess of 40% petroleum mahogany sodium sulfonate in "retained" oil, said solution having normally a viscosity appreciably in excess of 600 seconds Saybolt at 100° F. due to said sulfonate dissolved therein, and, substantially dissolved in said solution, 0.5 to 5% of at least one member of the group consisting of substantially oil soluble diethylene glycol and diethylene glycol alkyl ethers in amount sufficient to reduce said viscosity appreciably in excess of 600 seconds Saybolt at 100° F. to a point sufficiently low to yield upon extension to a 28-40% sulfonate content with a solvent of the petroleum hydrocarbon type having a viscosity of from 40 to 150 seconds Saybolt at 100° F., a viscosity of the extended solution below 600 seconds Saybolt at 100° F.

7. A substantially self-scouring lubricated textile material which comprises a textile material impregnated with a viscosity reduced petroleum mahogany sulfonate solution essentially consisting of a petroleum mahogany sodium sulfonate solution in an organic substantially water immiscible solvent for said sulfonate having normally a relatively high viscosity due to said sulfonate dissolved therein of in excess of 600 seconds Saybolt at 100° F. for a sulfonate content of at least 28%, and, substantially dissolved in said solution 0.5 to 5% of at least one member selected from the group consisting of substantially oil soluble diethylene glycol and diethylene glycol alkyl ethers.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Certificate of Correction

Patent No. 2,454,828.

November 30, 1948.

JACOB FAUST

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 1, line 1, before the words "Petroleum mahogany" and under the numeral "1", insert the following paragraph:

This invention relates to new and useful improvements in the viscosity reduction of petroleum mahogany sulfonate hydrocarbon solutions. This is a division of my copending application Serial No. 711,837, filed November 23, 1946.;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of April, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.