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3,634,272

SYSTEMS FOR SOLUBILIZING WATER AND HALOGENATED ALIPHATIC HYDROCARBONS

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No Drawing. Continuation-in-part of application Ser. No. 227,986, Oct. 3, 1962. This application Oct. 25, 1968, Ser. No. 770,849

Int. Cl. C11d 1/18, 1/12

U.S. Cl. 252—153 8 Claims

ABSTRACT OF THE DISCLOSURE

Water or aqueous alkali metal hydroxides, salts or acids can be solubilized as clear solutions in hydrophobic liquids such as chlorinated hydrocarbon solvents by the use of urea as a solubilizing aid in combination with a surfactant system consisting of an aliphatic diphenyl oxide sulfonic or its ar-chlorinated or brominated derivatives and one of several well known surfactants, neither class of which will in itself solubilize the two principal ingredients.

This application is a continuation-in-part of application Ser. No. 227,986, filed Oct. 3, 1962, now abandoned.

The present invention relates to improved systems for solubilizing water or aqueous solutions and halogenated aliphatic hydrocarbons into each other. More particularly, the present invention concerns the use of urea as a solubilizing aid for the common surface active materials in combination with the class of anionic surfactants known as the alkyldiphenyl oxide sulfonates and alkylchlorodiphenyl oxide sulfonates whereby smaller amounts of surfactant are employed to accomplish the solubilization of water into the solvent and vice versa. In our companion applications we have taught the use of the diphenyl oxide sulfonates as effective materials, alone or in combination with commercial surfactants, to solubilize water or aqueous solutions in organic hydrophobic liquids. The present invention is an improvement on this earlier invention whereby smaller amounts of the surfactants can be employed when small amounts of urea are added along with the surfactant system. The advantages of this latter combination are evident in the commercial application in that the cost of the surfactant in such systems is materially reduced, since the surface active material is expensive, and further that greater amounts by weight of the desired water-solvent can be obtained in a given composition; thereby effectively increasing the utility of the composition.

In accordance with the present invention water can be solubilized into a halogenated aliphatic hydrocarbon solvent by incorporating therewith two surfactants selected from the following classes of surfactants and from 0.5 to about 2% by weight urea. The surfactants which have proven to be effective in accordance with the present invention, when employed as a binary surfactant system the lesser being present in an amount not less than 10% by weight of the total surfactant system, are those selected from the group consisting of alkali metal fatty alcohol

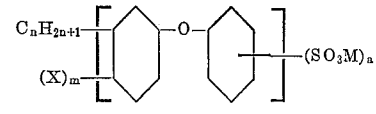
sulfates, alcohol ether alkali metal sulfates, fatty acid alkylolamides, alkali metal fatty amide sulfates, alkali metal alkylaryl sulfonates, alkali metal alkyldiphenyl oxide sulfonates, alkali metal alkyl chlorodiphenyl oxide sulfonates, alkali metal alkyl naphthalenes sulfonates, alkali metal petroleum sulfonates, sulfonated fatty ester, alkylphenoxy polyoxyalkylene alcohol sulfonates, and alkali metal-N-alkyl-N-fatty acid taurates and isethionates, and the like. Thus, one can employ an alkali metal alkyldiphenyl oxide fatty acid taurates and isethionates, and the like. Thus, one can employ an alkali metal alkyldiphenyl oxide sulfonate and an alkali metal-N-alkyl-N-fatty acid taurate, for example.

Good results are achieved when the surfactant is employed in from about 5 to about 30% by weight of the total composition and the urea is employed in about 0.5 to about 2% by weight. It is to be understood that what has been said above relative to solubilization of water or aqueous basic solution in the halogenated aliphatic hydrocarbon solvent can be equally applicable to the solubilization of the halogenated aliphatic hydrocarbon solvent in the water or aqueous solution.

The classes of halogenated aliphatic hydrocarbon solvents which have applicability to the present invention are the halogenated aliphatic hydrocarbons having from 1 to 3 carbon atoms, such as, for example, the chlorinated alkanes and alkenes, the brominated alkanes and alkenes, the fluorinated alkanes and alkenes, the bromo-chloro, chloro-fluoro, bromo-fluoro alkanes and alkenes. Some of the more common solvents falling within the above definitions are methylene chloride, chloroform, carbon tetrachloride, dichloroethane, ethylene dichloride, trichloroethane, perchloroethylene, hexachloroethane, dichloropropylene, and the like. Equally useful are the bromo and fluoro analogs as well as the mixed bromo-fluoro and chloro-fluoro analogs.

The aqueous component can be water, aqueous alkali metal, alkaline earth metal and amine solutions including aqueous ammonia. Thus, one can solubilize aqueous sodium hydroxide, potassium hydroxide, ammonium hydroxide solutions in a halogenated hydrocarbon solvent or the solvent in the aqueous solution in accordance with the present invention.

The alkylated diphenyl oxide sulfonate which can be employed in accordance with the present invention is that having the general formula:



wherein X represents a halogen having an atomic number from 17 to 35, n represents an integer from about 6 to 22, m is an integer from 0 to 2, a represents an integer from 1 to 2, M represents one equivalent of an anion selected from the group consisting of alkali metal, alkaline earth metal, ammonium, alkylamines and alkanolamines. The alkylamines are preferably saturated amines of 1 through 5 carbon atoms, such, specifically, as mono-, di-, and tri-

methyl, ethyl, propyl, butyl, and pentyl amines. The alkanolamines which can be employed are preferably those containing alkyl groups of from 1 through 5 carbon atoms, such, specifically, as monomethanol amine, dipropanol amine and monobutanol amine.

Representative of the classes of surface active materials which are useful as a co-surfactant are the alkali metal salts of the fatty alcohol sulfates such as Stepanol M1, a sodium fatty alcohol sulfate; Duponol WAQ, technical lauryl sodium sulfate; Alropon Conc., sodium salt of a secondary alcohol sulfate; Duponol, LS, technical sodium alkyl alcohol sulfate, and the like; the alkali metal alcohol ether sulfates such as Duponol RA, an alcohol ether sodium sulfate, and the like; the fatty amide sulfates such as Stepan HDA-7 of a fatty acid alkylol amide, Dianol, a fatty amide sulfate, and the like; the petroleum sulfonates such as Petronate HL, CR, K, Petromix No. 9 and 10 (modified petroleum sulfonates and soap), Bryton Sherosope F430, Shell petroleum sulfonate, Petrosul 742 and 745, and the like; the alkylaryl sulfonates and alkyl naphthalene sulfonates such as Nacconal HG, ABS (alkyl benzene sulfonate), and the like; the alkylphenol polyoxyalkylene alkanol sulfates such as Alipal CO-433, Stepanol B-153, Krystallex S-75, and the like, the alkyl phenoxy polyoxyalkylene alkanols such as Igepal CO-430 and the like; the N-alkyl-N-fatty acid taurates such as Igepon CN-42, and the like.

The following examples are illustrative of the present invention but are not to be construed as limiting.

EXAMPLE 1

Sodium dodecylmonochlorodiphenyl oxide sulfonate, 0.4 gram, was dissolved in 4.6 g. of methylene chloride, then 4.6 g. of water was added with thorough mixing. Thereafter, 0.3 g. of 20% active sodium N-cyclohexyl-N-palmitoyl taurate (Igepon CN-42) was added with thorough mixing, followed by 0.3 g. aqueous 28% NH_4OH with continued thorough mixing. Urea was added until a clear solution was observed. In the above case 0.2 g. urea was added.

EXAMPLE 2

In the following examples employing the same general procedure as above, the following compositions were prepared as clear solutions:

(A) 2.8 g. of 28% active sodium salt of a sulfate ester of an alkyl phenoxy polyethyleneoxy ethanol (Alipal CO-433), 9.2 g. of methylene chloride, 7.2 g. of water, 0.1 g. of sodium N-methyl-N-"coconut oil acid" taurate (Igepon TC-42), 0.6 g. of 28% aqueous sodium hydroxide, and 0.45 g. of urea.

(B) employing the same formulation except that no Igepon TC-42 was added; there was required only 0.15 g. of urea to make a clear solution.

EXAMPLE 3

Employing the enumerated surface active agents in the amounts indicated in the following formulation, there was obtained a clear solution:

	G.
Sodium dodecylmonochlorodiphenyl oxide sulfonate	0.4
Methylene chloride	4.6
Water	4.6
Surfactant (B)	0.2
28% aqueous ammonium hydroxide	0.3
Urea	x

Surfactant (B):	Grams urea needed to make clear
Stepanol M1	0.2
Stepanol M2	0.3
Stepan HDA-7	0.1
Duponol WAT	0.1
Duponol WAQ	0.3
Naccanol HG	0.3
Aerosol C	0.2
Pendit WA-T	0.3
Trepenol T	0.3
Alropon Conc.	0.4
Ninex 23	0.3
Glucaterge	0.4
Tauranol WS	0.3
Alkanol S	0.5
Duponol RA	0.3
Nekal WS	0.25
Burkem 288	0.3
Neopon	0.25
Sulfochlourate	0.2
Tergitol Anionic 7	0.4
Shell pet. Sulfonate	0.1
Bryton Sherosope F430	0.1
Stepanol B-153	0.1
Petrosul 745	0.3
Petrosul 742	0.3
Dianol	0.2
Igepon TC-42	0.2
Igepon CN-42	0.2
Petronate K	0.2
Petronate CR	0.2
Petronate HL	0.2
Petromix No. 9	0.2
Petromix No. 10	0.2
Morcowet 469	0.2
Duponol LS	0.2

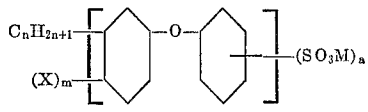
(1) Stepanol M1—fatty alcohol sulfate
(2) Stepanol M2—fatty alcohol sulfate
(3) Stepan HDA-7—fatty acid alkylolamide
(4) Duponol WAT—triethanolamine salt of lauryl sulfate
(5) Duponol WAQ—technical lauryl sodium sulfate
(6) Naccanol HG—alkyl aryl sulfonate
(7) Aerosol C—ethanolated alkyl guanidine amine complex
(8) Pendit WA-T—sodium salt of lauryl sulfate
(9) Trepenol T—nonylphenol polyglycol ether sulfonate triethanolamine salt
(10) Alropon Conc.—salt of a secondary alcohol sulfate
(11) Ninex 23—amido sulfonate complex
(12) Glucaterge—fatty acid condensate N-methyl glucamine and coconut fatty acid
(13) Tauranol WS—sodium N-methyl-N-alkyl-taurate
(14) Alkanol S—sodium tetrahydronaphthalene sulfonate
(15) Duponol RA—alcohol ether sodium sulfate
(16) Nekal WS—sulfonated aliphatic polyester
(17) Burkem 288—sulfated fatty ester
(18) Neopon—sodium oleyl methyl tauride
(19) Sulfochlourate—lauric acid ester—K salt of sulfoacetic acid amidified with β-amino ethyl alcohol
(20) Tergitol Anionic 7—sodium sulfate derivative of 3,9-diethyl tridecanol-6
(21) Shell pet. Sulfonate—petroleum sulfate
(22) Bryton Sherosope F430—sodium petroleum sulfonate
(23) Stepanol B-153—ammonium alkyl phenoxy polyoxyethylene sulfate
(24) Petrosul 745—petroleum sulfonate
(25) Petrosul 742—petroleum sulfonate
(26) Dianol—fatty amide sulfate
(27) Igepon TC-42—sodium N-coconut-acid-N-methyl taurate
(28) Igepon CN-42—sodium N-cyclohexyl-N-palmitoyl taurate
(29) Petronate K—petroleum sulfonate
(30) Petronate CR—petroleum sulfonate
(31) Petronate HL—petroleum sulfonate

(32) Petromix No. 9—petroleum sulfonates plus soap
(33) Petromix No. 10—petroleum sulfonates plus soap
(34) Morowet 469—alkyl naphthalene sulfonate
(35) Duponol LS—technical oleyl alcohol sulfate

While there has been disclosed and described what is at present considered to be the preferred embodiment of the invention, it will be understood that many modifications and changes and substitutions may be made therein without departing from the true scope of the invention as defined in the appended claims.

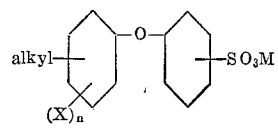
What is claimed is:

1. As an new composition of matter a clear solution consisting essentially of 10 to 50 percent aqueous component, 90 to 50 percent of a halogenated hydrocarbon solvent having from 1 to 3 carbon atoms and from 1 to about 25 percent, all percentages being weight based on the total composition, of a surfactant system consisting of from 10 to 90% by weight based on the total surfactant system of a salt of an alkylated diphenyl oxide sulfonic acid having the formula:



wherein X represents a halogen having an atomic number from 17 to 35, *n* represents an integer from 6 to about 20, *m* represents an integer from 0 to 2, *a* represents an integer from 1 to 2 and M represents one equivalent of an anion selected from the group consisting of alkali metals, alkaline earth metals, ammonium, alkyl amines and alkanol amines, said alkyl amines and alkanol amines having 1 to 5 carbon atoms in their alkyl and alkanol groups, and the balance 90 to 10% by weight of the total surfactant system of a surface active agent selected from the group consisting of the N-fatty trialkyl ammonium halides, the alkyl phenol alkylene oxide condensates, and the alkali metal, alkaline earth metal, ammonium, alkylamine and alkanolamine salts of sulfated alkylphenol-alkylene oxide condensates, N-fatty acid-N-alkylamine alkanoic acid esters, alkylaryl sulfonates, fatty alcohol sulfates, petroleum sulfonates and from 0.5 to 2.0 percent by weight of the surfactant of urea.

2. A solubilizing agent adapted to solubilize water in halogenated hydrocarbon liquids as clear solutions consisting essentially of from 10 to 90 weight percent of a surface active material having the formula:



wherein X represents a halogen having an atomic number from 17 to 35, alkyl represents an alkyl radical having from 9 to 20 carbon atoms, M represents one equivalent of an anion selected from the group consisting of alkali metal, alkaline, earth metal, ammonium, alkyl amine and alkanol amine, said alkyl amine and alkanol amine containing 1 to 5 carbon atoms in their alkyl and alkanol groups, and *n* represents an integer from 0 to 1; from 90 to 10 weight percent of a surfactant selected from the group consisting of alkali metal salts of fatty alcohol sulfates, alkanol ether sulfates, fatty acid alkyloylamides, fatty amide sulfates, alkylaryl sulfonates, petroleum sulfonates, sulfonated fatty esters, alkylphenyl polyoxy alkylene sulfonates and alkyl-N-fatty acid taurates; and from about 0.5 to about 2.0 weight percent urea.

3. The composition of claim **1** wherein said halogenated hydrocarbon solvent is a chlorinated hydrocarbon solvent.

4. The composition of claim **3** wherein said chlorinated hydrocarbon solvent is methylene chloride.

5. The composition of claim **3** wherein said solvent is perchloroethylene.

6. The composition of claim **1** wherein said aqueous component is an aqueous inorganic alkali.

7. The composition of claim **6** wherein said aqueous inorganic alkali is sodium hydroxide.

8. The composition of claim **1** wherein said aqueous component is an aqueous solution of ammonium hydroxide.

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U.S. Cl. X.R.
252—152, 161, 162

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,634,272 Dated January 11, 1972

Inventor(s) Joseph C. Valenta and Alfred F. Steinhauer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 5, change "naphthalenes" to -- naphthalene --.

Column 2, lines 10 and 11, delete -- fatty acid taurates and isethionates, and the like. Thus, one can employ an alkali metal alkyldiphenyl oxide --.

Column 6, Claim 2, line 10, after "alkaline" delete -- , --.

Signed and sealed this 22nd day of August 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents