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WASHING AND CLEANSING COMPOSITION

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6 Claims. (Cl. 87—5)

This invention relates to compounds or compositions intended for washing, cleansing and scouring purposes, and is concerned in particular with the soluble sulphates and/or sulphonates of hydrocarbons of petroleum origin.

In the acid sludge obtained by the refining of various petroleum distillates, such as gasoline, kerosenes and also white oil intended for medicinal use and the like, with sulphuric acid there exist various sulphonic acids which on purification and conversion to an alkali salt, as for example to sodium sulphonate, possess useful properties as wetting agents and also in the case of compounds containing hydrocarbon molecules with a considerable number of carbon atoms exhibit detergent and emulsifying properties. Wetting agents of this type, containing a considerable number of carbon atoms also possess other and unusual properties which will be described hereinafter.

When a primary alcohol containing 7 or 8 carbon atoms is treated with sulphuric acid to form the hydrogen alkyl sulphate and this acid body is neutralized with alkali (alkali metal, also in some cases alkaline earth) hydroxide, such as sodium or potassium hydroxide, a soluble compound is obtained which has a so-called wetting property, that is it assists in creating penetration in porous surfaces and especially in textile fabrics. Water, for example, containing the wetting agent will wet through a mass or web of fabric more rapidly than when the wetting agent is omitted. When the number of carbon atoms in the hydrocarbon molecule exceeds 8 as a rule the sulphated material suitably neutralized will be found to have a less pronounced wetting action and a greater emulsifying power. Such emulsifying quality gives rise to a detergent value which up to a certain point tends to increase as the number of carbon atoms in the hydrocarbon chain increases. At the same time, however, the solubility of the resulting alkali sulphate in cold water decreases so that above C_{18}, for example, solubility is relatively poor. Thus while a C_{12} sulphate will dissolve readily enough in cold water and may be expected to serve as a good emulsifying agent or detergent, the C_{16} or C_{18} salt of a corresponding character requires hot water to bring about solution to a degree sufficient to exert pronounced emulsifying and detergent characteristics. At least this is the general rule, there being some divergence therefrom and, of course, not necessarily a decided line of demarcation between the cold water and the hot water soluble compounds.

If a wetting agent derived from the sulphonic acids of acid sludge is incorporated with the alkali salts of the sulphated alcohols, particularly those containing 18 or more carbon atoms, the sulphates exhibit an improved condition of solubility permitting enhanced activity thereof at water temperatures below that required for a normal degree of detergency, as hereinafter illustrated.

These salts of sulphated alcohols, which possess a potential or latent detergent action in cold water are therefore designated latescent detergents or more briefly as latergents and before the addition of the sulphonated wetting agent or latescence activator are in a condition (in cold water) substantially of latent detergency or latergency. The sulphonates derived from acid sludge, when added to these latescent detergents or latergents increase or develop this latent detergent action and are therefore called latergent activators.

Latescent detergents or latergents for the most part may be of the sulphated type, that is an alkyl hydrogen sulphate in which the hydrogen is replaced by an alkali metal base, alkaline earth base and the like, thus providing a water-soluble compound. The sulphate (HSO_4) group may be in a terminal position or it may be united with the hydrocarbon radical in the secondary or even the tertiary position.

For example, in the oxidation of hot paraffin wax by air blowing there may be obtained both primary and secondary alcohols some of which are formed from hydrocarbons containing well over 18 carbon atoms in the molecule. Some of these alcohols may have 20 or 30 carbon atoms (or more) per molecule. The greater the number of carbon atoms the lower, other things being equal, the solubility of the alkali sulphate in cold water. The highest of such molecules give sulphates which are scarcely soluble even in hot water.

It is within the scope of the present invention to employ latescence activators, not only for the medium sulphates of, say, 16 to 18 carbon atoms but also for the higher sulphates of the range, say, 20 to 30 carbon atoms in the molecule.

Latescence activators or stimulators of latergency are, as indicated, preferably sulphonates as distinguished from sulphates. The place of sulphonation may, however, be, and generally is the secondary position. When the hydrocarbon chain or structure is of considerable length there may, therefore, exist a number of isomers, depending on the precise carbon atom carry-

ing the sulphonic group. Mixtures of isomeric sulphonates and homologues preferably are employed, in the form obtainable from acid sludge as noted.

The average molecular weight of the compounds forming such mixtures will vary with the particular petroleum distillate which has been treated with sulphuric acid and by choosing a sludge from an appropriate distillate some approximation to a desired average molecular weight in the sulphonate may be reached.

Secondary sulphonates from straight chain hydrocarbons may carry the sulphonic group near the center of the molecule, thus giving somewhat the effect of two chains of about the same length extending from the sulphonic group. For example, a C_{22} molecule carrying the sulphonic group on C_{11} would possess (roughly the equivalent for purposes of the present invention) two chains one of C_{10} and the other of C_{11} magnitude. On the other hand one chain may be short, say C_4, and the other much longer, viz. C_{17}.

Hence by using a mixture of such sulphonates a latergent activator of averaged quality is cheaply secured.

The odor of acid sludge may be largely eliminated by suitable purification. If the product is derived from sludge which has been formed by the action of cold sulphuric acid on refrigerated oils or naphthas, a light colored sulphonate of reasonably good odor may be obtained without protracted refining of the sulphonate.

Latergent activators containing molecules having more than one sulphonic group likewise are within the purview of the invention.

If parraffin wax is maintained at a temperature of 150° C. or possibly somewhat higher, preferably in the presence of catalysts such as manganese compounds, boric acid, and the like, oxygen is added to the wax molecules resulting in a mixture of wax acids, aldehydes, ketones and alcohols, along with a portion of unoxidized wax. By suitable treatment with alkali solutions or by extraction with solvents the wax acids may be separated from the remainder of the oxidized material and unchanged wax and usually separation by solvents and the like permit of the alcoholic portion to be extracted. The alcohols obtained in this way are a mixture of primary and secondary ones. These may be sulphated by treatment with sulphuric acid to form the alkyl hydrogen sulphate and the latter neutralized by soda ash or other alkali or alkaline earth material appropriate for the purpose. In this way there is obtained an emulsifying or detergent material which may be reinforced in activity by the sulphonated compounds derived from acid sludge.

The latescence activator sulphonates may be used as derived from the refining of acid sludge components or they may be more or less separated into derivatives of acids possessing different molecular weights, by fractional precipitation, for example, from solvents. As an illustration, the sodium sulphonates of a mixture of acids exhibiting an average molecular weight of about 400 (called mixed acids) were separated into derivatives of acids with molecular weights of about 325–350 and acids with molecular weights of about 425–475.

For most effective activation I prefer to employ a major proportion of latergent activator with a minor proportion of the detergent. For example, a mixture of these two components may be in a proportion of 55 per cent, 60 per cent, 75 per cent, 85 per cent, and the like, of the latergent activator with a corresponding diminishing proportion of the latergent. In some cases, however, I may reverse the proportions and have the latergent activator present as a minor constituent. In still other (special) cases, particularly if secondary alcohols obtained by wax oxidation, and the like, have the hydroxyl group so positioned in a long chain molecule that on sulphation a compound is obtained having a short hydrocarbon chain and a long hydrocarbon chain in the molecule, the joint action of both wetting power and emulsifying effect may arise. Since it is possible to obtain waxes which have molecules containing from, say, C_{18} to C_{30} carbon atoms in their structure, it will be understood that should, for example, one obtain by oxidation a secondary alcohol with 24 carbon atoms containing hydroxyl on the 6th carbon atom, sulphation of this compound and subsequent neutralization gives rise to a C_6 activator and a C_{18} latergent all constituted in one molecule. This is designed to provide a cleansing material comprising detergent and activator in molecular combination.

However, this does not preclude the addition thereto of a sulphonate latescence activator derived from an extraneous source such as the herein described salts of sulphonic acids from petroleum sludge, the proportion of the added activator being sufficient to raise the cold-water solubility of the secondary sulphate as may be required.

In Examples 1 to 5 inclusive, which follow, an alkali metal salt, viz: the sodium salt of a primary sulphate detergent and emulsifying agent containing on the average 12 carbon atoms is employed, while in the remaining examples the sulphate contains a higher number of carbon atoms in the molecule, viz: in the neighborhood of 18 carbon atoms. Owing to the relatively low solubility of the sulphated alcohols of the higher molecular weight preferably there is present in the cleansing composition per se (that is without abrasive or filler, extending agent, and the like) at least 50 per cent of the latergent activator, the proportion of the latter being present in solubility-conferring proportions, that is, sufficient activator is present to enable the less soluble higher molecular weight latergent to dissolve with sufficient freedom in water to exert a substantial measure of cleansing action.

Example 1.—Six parts by weight of (325–350 molecular weight) sodium salts of sludge sulphonic acids from petroleum were thoroughly incorporated with four parts by weight of the alkali salt of a suphated alcohol emulsifying agent. The resulting product was a light fluffy powder, which was used to wash cloths, glassware, and as a toilet "soap", as for example, washing one's hands.

Example 2.—Six parts by weight of the sodium salts of mixed sulphonic acids were thoroughly incorporated with four parts of the alkali salt of a sulphated alcohol detergent and emulsifying agent. This product was also a light fluffy powder. which could be used as a toilet "soap" powder, and also for general cleaning purposes.

Example 3.—Mild abrasives may be incorporated with these soap powders. For example, 2 parts by weight of kieselguhr were mixed with 1 part by weight of the powder prepared according to Example 2. This powder was used for washing the hands, for cleaning pots and pans, earth-

enware, and in other similar cleansing operations.

Example 4.—Sharp abrasives may be employed also. For example, 2 parts by weight of silex were thoroughly incorporated with 1 part by weight of the powder prepared according to Example 1. The product so obtained could be employed for cleaning purposes, as for example, the scouring of aluminum vessels.

Example 5.—These powders can be molded into various shapes, for example, in the following manner. About 7.5 per cent by weight of hydronaphtha was added to the powder, as prepared in Example 2, and thoroughly incorporated by grinding. The resulting material was then placed in a mold and sufficient pressure exerted to cause the mass to assume the shape of the mold. On removal the material retained the shape of the mold, and was used in cake form for various cleansing purposes.

Example 6.—70 per cent of the sulphonated wetting agent or activator was mixed with 30 per cent of high molecular weight alcohol sulphate latergent, both materials being in powdered form. The powder was found to possess good cleansing properties, even in the presence of hard water.

Example 7.—80 per cent of the sodium salts of mixed sulphonated acids (activator) was added to 20 per cent of the high molecular weight sulphate emulsifying agent (latergent), both materials being in the powdered form. This powder was found to possess good cleansing properties even in the presence of hard water.

Example 8.—About 10 per cent of hydronaphtha was incorporated with the powder as prepared in Example 7, and the resulting material molded as described in Example 5.

Example 9.—In one instance it was found that 2.25 parts of the latergent was soluble in 100 parts of cold water. In the presence of 3.79 parts of the latergent activator the solubility of the latergent increased to 3.42 parts per 100 parts of water.

Example 10.—In another instance when the latergent was found to be soluble to the extent of 1.3 parts per 100 parts of water it was noted that the presence of 5 parts of latergent activator increased the solubility to 3.1 parts per 100 parts of water.

While, as may be inferred from the foregoing, I prefer to employ the sulphonates and sulphates in the form of their sodium compounds, I do not wish to be limited to the choice of alkali metal or alkaline earth base so employed but may use any of the bases of these groups or mixtures of these as desired. Further there may be incorporated in the composition fillers, perfumes, and coloring agents, as desired. The cleansing material may be employed either in liquid, powder or cake form, in various applications including domestic cleansing operations, power laundries, and for textile or other industrial purposes.

The hydronaphtha referred to in Examples 5 and 8 may be produced either by hydrofining (i. e. refining by hydrogenation) or by hydroforming (i. e. forming by destructive hydrogeneration).

For most purposes I prefer that the composition be free from ordinary soap such as is made by the saponification of glyceride oils, since such soaps react with the lime compounds and other constituents on hard water to form curds which are objectionable. If the composition is prepared free from such soaps it may be used advantageously in hard waters without the difficulty mentioned. If a small proportion of ordinary soap be present it may not form curds when the composition is used, as the presence of the latergent and latergent activator may create a condition of colloidal dispersion. On the other hand, with larger proportions of soap curd formation in the presence of hard water is likely to occur to an objectionable degree. The present invention, therefore, contemplates a detergent suitable for use with hard or extremely hard water which composition is free or sufficiently free from ordinary soap to avoid objectionable curd formation.

What I claim is:

1. A cleansing material substantially free of fatty acid soaps comprising water-soluble mineral-oil acid sludge sulphonates and an alkali salt of an alcohol sulphate detergent, the latter being characterized by consisting of a sulphuric acid group and a hydrocarbon radical having more than 12 carbon atoms and having a poor solubility in water.

2. Composition according to claim 1, in which the proportion of sludge sulphonates is greater than that of the sulphate detergent.

3. Composition according to claim 1, in which the proportion of sludge sulphonates is less than that of the sulphate detergent.

4. A cleansing material according to claim 1, in which the alcohol sulphate detergent contains at least 16 carbon atoms.

5. A cleansing material substantially free of fatty acid soaps comprising water-soluble mineral-oil acid sludge sulphonates and an alkali salt of an alcohol sulphate detergent, the latter being characterized by consisting of a sulphuric acid group and a hydrocarbon group containing at least 16 carbon atoms and having a poor solubility in water, the proportion of water-soluble mineral-oil sludge sulphonates being sufficient to increase the solubility of the latescent detergent in water.

6. Method of increasing the solubility of an alkali salt of an alcohol sulphate detergent in water, said detergent being characterized by consisting of a sulphuric acid group and a hydrocarbon radical containing at least 16 carbon atoms, which comprises incorporating with said detergent agent a substantial proportion of water-soluble mineral-oil acid sludge sulphonates.

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