

UNITED STATES PATENT OFFICE

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PROCESS OF RESOLVING OIL EMULSIONS AND REAGENTS THEREFOR

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This invention relates to processes of treating oil emulsions and reagents therefor, and more particularly to the treatment of petroleum oil and water emulsions for breaking or resolving such emulsions.

Various mineral oils as they are obtained from the wells contain substances which have caused them to emulsify with the water present, and in such condition, they are not advantageously marketable. The emulsions from different wells and sometimes even from the same well at different periods, differ in character and ordinarily require the use of different reagents for their satisfactory treatment.

An important object of the present invention is to provide an inexpensive, practical, effective and quick method of breaking the emulsion to separate the oil from the water and foreign matter therein.

Another object of the invention is the provision of a deemulsifying reagent which is sufficiently soluble in or miscible with the dispersing phase or both the dispersing and dispersed phases of the oil and water emulsion to quickly act upon one or both of them to effect the rapid breaking of the emulsion.

A further object of the invention is to provide a de-emulsifying reagent of such potency and effectiveness that emulsions can be completely broken by the use of a much smaller quantity of reagent than is required in the case of prior de-emulsifying reagents.

A further object of the invention is to provide a de-emulsifying reagent which may be effectively used in breaking oil and water emulsions from different wells and of different characters which are incapable of being effectively broken by any single prior deemulsifying reagent.

I have discovered that numerous naturally occurring mineral oil and water emulsions can be broken or resolved by treating them with an acid addition or substitution product of a mineral oil soluble in the dispersing phase of such emulsions and preferably such addition or substitution product soluble in both phases of the emulsion. I also have discovered that better results are obtained and that all naturally occurring mineral oil and

water emulsions with which I am acquainted can be resolved by treating such emulsions with such addition or substitution product and a fat or fatty oil preferably a vegetable oil such as cottonseed oil.

I prefer to employ a sulfonated mineral oil preferably sulfonated paraffin petroleum oil or ingredients thereof but may use any acid addition or substitution product of a mineral oil soluble in the dispersing phase of a mineral oil and water emulsion. Such products may be obtained by treatment of the mineral oils or ingredients thereof by known methods with mineral acids as for example, phosphoric acid, or organic acids, as for example, acetic acid, capable of forming acid addition or substitution products therewith. It is preferable to employ mineral acid addition or substitution products of the mineral oil owing to their greater effectiveness and owing to the difficulty of forming addition or substitution products of mineral oil with organic acids and I have obtained the most satisfactory results with sulfonated mineral oil particularly when employed with a fat or fatty oil.

The term acid derivatives of a mineral oil as herein employed contemplates any acid addition or substitution product of a mineral oil or ingredient or ingredients thereof capable of forming acid addition or substitution products and the term fatty acid glycerid as herein used contemplates any fat or fatty oil.

In the preferred practice of my invention, I employ a sulfonated mineral oil preferably sulfonated paraffin petroleum oil or ingredients thereof capable of being sulfonated and a fat or fatty oil preferably a vegetable oil such as cottonseed oil, olive oil, castor oil or the like. The mixture preferably contains the sulfonated mineral oil and the fat or fatty oil in the proportions of about two parts by weight of the former to one part by weight of the latter. I have found that a mixture of the ingredients in such proportions constitutes a deemulsifying reagent adapted for effectively breaking emulsions from quite a large number of different wells requiring different treatments by prior

processes. However, the proportions of these materials may in some cases be varied, satisfactory deemulsification being possible in the case of emulsions from certain different individual wells by the use of the ingredients in different proportions varying from 1 to 4 parts by weight of the sulfonated mineral oil to 2 to 10 parts by weight of the fatty oils. To obtain the most economical and in some cases the best results, I preferably apply a test treatment of my reagent mixed in different proportions to the particular emulsion to be broken and thus readily ascertain the proportions of sulfonated mineral oil and fat or fatty oil which can most advantageously be used.

The sulfonated mineral oil is prepared by any known method of sulfonation from natural or cracked petroleum oil, preferably paraffin petroleum oil or ingredients thereof capable of being sulfonated, any excess of the acid employed being preferably removed and the product freed from by-products of the sulfonating process so that the product is preferably substantially free from uncombined acid and other impurities.

While I prefer to employ a fatty oil in preparing my deemulsifying reagent, some measure of success ordinarily is obtainable by the use of a fat, even one of high stearine content such as tallow, but fatty bodies of low stearine and high olein content, such as vegetable oils, are preferred.

In place of the fat or fatty oil I may with some degree of success employ any of the well known fatty acids, such for example, as oleic acid, but I prefer to employ the glycerids.

The fatty acid glycerids may, if desired, be dissolved in a suitable solvent such as naphtha before being added to the sulfonated mineral acid and in the use of a fat of high stearine content, the reagent may be more readily prepared by first dissolving the fat.

I have found that numerous mineral oil and water emulsions can be broken by the use of a sulfonated mineral oil preferably sulfonated paraffin petroleum oil or ingredients thereof capable of being sulfonated without the use therewith of a fat or fatty oil but in my experiments I have obtained better results by employing fat or fatty oil with the sulfonated mineral oil.

In practicing my process, a small amount preferably from .02 to .1 per cent. by weight of the reagent is placed in a quantity of the oil and water emulsion to be treated and the emulsion allowed to stand until the oil separates and rises to the top. The oil and water may then be separated and the impurities or foreign matter removed with the water. In some instances, as for example, where a fat is employed in the deemulsifying reagent or where an emulsion of a heavy mineral oil and water is under treatment, the emulsion may advantageously be heated preferably to the

initial boiling point of the oil or in the case of an emulsion of a very heavy mineral oil, to a temperature of from about 20 to 60° F., above such initial boiling point and then allowed to stand until the oil separates out of the emulsion.

In treating different types of emulsions, different forms or embodiments of my reagent sometimes may advantageously be employed. I have found however, that a mixture of sulfonated mineral oil and cottonseed oil when mixed in the preferred proportions of about 2 parts by weight of the former to 1 part by weight of the latter and employed in the proportion of about .025 per cent. by weight with respect to the emulsion, is generally operative in effecting rapid and satisfactory deemulsification of most mineral oil and water emulsions.

In some particular emulsions I have found that the addition of a small quantity of phenol to the reagent is advantageous and in such cases, I employ phenol of about 25 to 35 per cent. strength in the proportion of about from 3 to 10 per cent. by weight of the mixture of sulfonated mineral oil and fatty acid glycerids.

In the preferred embodiment of the invention, I prepare the reagent by first sulfonating ingredients of paraffin petroleum oil capable of being sulfonated. Any excess acid is removed and the product purified and the sulfonated product is then mixed with cottonseed oil in the proper proportion as hereinbefore indicated. This material is then added to the emulsion to be treated in the proportion of about from .02 to .1 per cent. and ordinarily preferably about .02½ per cent. by weight of the emulsion and the emulsion is allowed to stand until it breaks and the oil rises to the top. The oil may then be readily separated from the water and foreign matter.

The process is performed in substantially the same manner and substantially the same percentage of the reagent is preferably used, regardless of changes in the specific composition of the reagent except that in using organic acid addition or substitution products of mineral oil I preferably employ about twice as much of the reagent as I employ in using sulfonated mineral oil.

While I have described in detail the preferred practice of my process, it is to be understood that the details of procedure may be widely varied without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto an acid derivative of a mineral oil and a fatty acid glycerid and causing such added materials to act upon the emulsion until such emulsion is broken or resolved.

2. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a mineral acid derivative of a mineral oil and a fatty acid glycerid and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 5
 3. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto an acid derivative of a mineral oil and a fatty acid glycerid, heating the mixture, and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 10
 4. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto an acid derivative of a mineral oil, a fatty acid glycerid and phenol, and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 15
 5. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a sulfonated mineral oil and a fatty acid glycerid and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 20
 6. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a sulfonated mineral oil and a fatty oil and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 25
 7. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a sulfonated mineral oil and cotton seed oil and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 30
 8. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a sulfonated mineral oil, a fatty acid glycerid and phenol, and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 35
 9. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a sulfonated mineral oil, a fatty oil and phenol, and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 40
 10. The process of breaking or resolving emulsions of mineral oil and water comprising adding thereto a sulfonated mineral oil and a fatty acid glycerid, heating the mixture, and causing such added materials to act upon the emulsion until such emulsion is broken or resolved. 45
 11. A reagent for breaking or resolving emulsions of mineral oil and water containing an acid derivative of a mineral oil and a fatty acid glycerid. 50
 12. A reagent for breaking or resolving emulsions of mineral oil and water containing a mineral acid derivative of a mineral oil and a fatty acid glycerid. 55
 13. A reagent for breaking or resolving emulsions of mineral oil and water containing an acid derivative of a mineral oil, a fatty acid glycerid and phenol. 60
 14. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil and a fatty acid glycerid. 65
 15. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil and a fatty oil. 70
 16. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil and cottonseed oil. 75
 17. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil, a fatty acid glycerid, and phenol. 80
 18. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil and a fatty acid glycerid in the proportions of about 1 to 4 parts by weight of the former to 2 to 10 parts by weight of the latter. 85
 19. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil and a fatty oil in the proportions of about two parts by weight of the former to one part by weight of the latter. 90
 20. A reagent for breaking or resolving emulsions of mineral oil and water containing a sulfonated mineral oil, a fatty acid glycerid and phenol in the proportions of about 2 parts by weight of the sulfonated mineral oil, 1 part by weight of the fatty acid glycerid and .09 to .3 parts by weight of the phenol. 95
- In testimony whereof I affix my signature.
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