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54 **Process for preparing overbased oil soluble magnesium salts and products obtained.**

57 **A process for preparing an over-based, oil-soluble magnesium salt of a sulphonic acid comprises contacting an acidic gas in the presence of a promoter system with a mixture of an oil-soluble magnesium salt of a sulphonic acid, a light magnesium oxide and an inert diluent. The promoter system comprises (1) a carboxylic compound selected from the group of compounds consisting of lower carboxylic acids, lower carboxylic anhydrides, substituted lower carboxylic acids, and metal salts and esters of lower carboxylic acids, (2) water, and optionally (3) a lower alkanol or lower alkoxy alkanol. The reaction is carried out at a temperature ranging from approximately 10°C (50°F) up to reflux temperature of the mixture. The volatile components are stripped from the reaction mixture after absorption of the acidic gas is at a desired level to give an over-based, oil-soluble magnesium salt of the sulphonic acid.**

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A process for preparing over-based,  
oil-soluble magnesium salts.

TITLE MODIFIED  
see front page

This invention relates to over-based, oil-soluble magnesium salts of sulphonic acids having metal ratios ranging from approximately 10 up to approximately 40 and processes for preparing such over-based magnesium salts of sulphonic  
5 acids.

Over-based, oil-soluble magnesium salts of sulphonic acids are used as additives in oil-based compositions, such as lubricants, greases, fuels, and the like. They function as  
10 detergents and acid neutralizers, thereby reducing wear and corrosion and extending the engine life.

Highly basic magnesium salts of a sulphonic acid having a metal ratio of equivalents of magnesium to equivalents of  
15 sulphonic acid ranging from 10 up to 40 or more, particularly the higher metal ratios of 20 to 40 have been difficult to prepare in a one-step operation using MgO as a Mg source. In systems previously described, either insufficient magnesium was dispersed or an unfiltered product  
20 resulted.

It has been discovered that over-based magnesium sulphonates may be prepared in a one-step operation by using a reaction promoter system comprising (1) a carboxylic

compound selected from the group of compounds consisting of lower carboxylic acids, lower carboxylic anhydrides, substituted lower carboxylic acids, metal salts and esters of lower carboxylic acids and mixtures thereof, all having from 1 to 5 carbon atoms; (2) water and optionally (3) an alcohol selected from the group of compounds consisting of lower alkanols, lower alkoxy alkanols and mixtures thereof, all having from 1 to 5 carbon atoms. Such a promoter system gives a high quality over-based magnesium sulphate having very high metal ratios which is suitable for use in various types of oil-based compositions.

It is therefore an object of the invention to provide a process for manufacturing oil-soluble, over-based magnesium salts of sulphonic acids having metal ratios ranging from approximately 10 and upwards to approximately 40 or more where the product is prepared in a one-step operation of contacting the reaction mixture with an acidic gas.

It is a further object of the invention to provide a reaction promoter system for use in processes for manufacturing oil-soluble, over-based magnesium salts of sulphonic acids having metal ratios of 10 up to 40 or more.

It is another object of the invention to provide a process for preparing a magnesium salt of a sulphonic acid having very high metal ratios wherein over-basing of the sulphonic acid is accomplished by using a promoter system in combination with a light form of magnesium oxide.

This invention provides a reaction promoter system for use in the manufacture of an over-based, oil-soluble magnesium salt of a sulphonic acid having metal ratios of from approximately 10 up to approximately 40 or more, in a one-step operation of contacting an acidic gas with a mixture containing the sulphonic acid to be over-based.

According to the present invention there is provided a process for preparing an over-based oil soluble magnesium salt

of a sulphonic acid having a metal ratio of equivalents of magnesium to equivalents of sulphonic acid of from approximately 10 to approximately 40; comprising contacting an acidic gas with a mixture comprising:

- 5 (a) an oil-soluble magnesium salt of a sulphonic acid,
- (b) from approximately 10 equivalents up to approximately 40 equivalents of a light magnesium oxide per equivalent of sulphonic acid,
- (c) a promoter system comprising:
  - 10 (1) from approximately 0.5 to approximately 5 equivalents of an essentially oil-insoluble carboxylic compound per equivalent of sulphonic acid, said compound being selected from the group of compounds consisting of lower carboxylic acids, lower carboxylic anhydrides, substituted  
15 lower carboxylic acids, and mixtures thereof, all having from 1 to 5 carbon atoms,
  - (2) from approximately 2 to approximately 30 equivalents of water per equivalent of sulphonic acid, and
  - (3) from 0 to approximately 35 equivalents of an  
20 alcohol per equivalent of sulphonic acid, said alcohol being selected from the group of components consisting of lower alkanols, lower alkoxy alkanols and mixtures thereof, all having from 1 to 5 carbon atoms, and
  - (d) an inert solvent for lowering the viscosity of said  
25 mixture to facilitate mixing;

said contacting being conducted at a temperature ranging from approximately 10°C (50°F) up to reflux temperature of said mixture and the volatile components being stripped from the reaction mixture after absorption of the  
30 acidic gas by the reaction mixture is at a desired level to give an over-based, oil-soluble magnesium salt of a sulphonic acid.

The reaction mixture may be filtered either before or after  
35 the stripping of the volatile components to give the product in solution or in concentrated form.

Additional water and/or alcohol may be added continuously or portion-wise to the reaction mixture during the time

that the acidic gas is contacted with the mixture. The amount of water used in total should not exceed 30 equivalents per equivalent of sulphonic acid and the total amount of alcohol used should not exceed 35 equivalents per equivalent of sulphonic acid.

The aforementioned, and other objects, advantages and features of the invention will become apparent in the following detailed discussion of preferred embodiments according to this invention. It is understood that the following preferred embodiments are not to be interpreted as limiting the scope of the invention.

Promoter System

The essentially oil-insoluble carboxylic compound is represented by the formula:



wherein X is H,  $-\text{CH}_2\text{OH}$ ,  $-\text{CH}_2\text{Cl}$ ,  $-\text{CH}_2\text{Br}$ ,  $-\text{CH}_2\text{COCH}_3$ , or  $\text{RNH}_2$  and Y is H, R, or  $\text{M}_n$  where R is an alkyl radical of from 1 to 4 carbon atoms, the sum of all the carbon atoms in the R radicals not exceeding 5, and  $\text{M}_n$  is an alkali or alkaline earth metal atom wherein n is an integer of 1 or 2.

Preferred oil-insoluble carboxylic compounds of this invention are acetic acid, propionic acid, butanoic acid, glycine, chloroacetic acid, bromoacetic acid, glycolic acid, ethyl acetoacetate, sodium acetate, calcium acetate, and magnesium acetate. These compounds may be used individually or in combination with one another where the amount of this promoter ranges from .5 up to 5 equivalent per equivalent of oil-soluble sulphonic acid. Preferably the amount ranges from 0.7 to 1.3 equivalents. It has been found in most instances that if over 5 equivalents of the promoter are used, the reaction mixture becomes very viscous and although a product is obtained, the viscosity of the mixture makes the isolation of the product and the introduction of acidic gas into the mixture during the latter part of the process difficult.

The initial reaction mixture should have at least 2 equivalents of water per equivalent of sulphonic acid. The mixture may have up to 15 equivalents of water where the preferred range in the initial mixture is from 2 to 8  
5 equivalents of water per equivalent of sulphonic acid.

Although the mechanism of the reaction is not fully understood, it is theorised that the presence of water in the reaction mixture initiates absorption of the acidic gas by  
10 the reaction mixture. There is, however, a competing reaction for the water in the formation of hydroxides of the magnesium oxide. It is therefore preferred to minimise the reaction of water with the magnesium oxide by carrying out additions of small amounts of water to the reaction mixture  
15 during the time that the acidic gas is contacted with the reaction mixture so as to ensure that water is available in the system to promote the absorption of the acidic gas. The amount of water used determines to a certain extent the value of the metal ratio in that higher amounts of water  
20 used gives a higher metal ratio; however, with higher amounts of water, there is usually a resultant haziness in the product. On the other hand, a deficiency of water causes higher viscosity in the reaction mixture and a lower metal ratio.

25

The total amount of water added to the mixture over the entire reaction time should not exceed 30 equivalents per equivalent of oil-soluble sulphonic acid used. The optimum amount of water to be used is determined by the amount of  
30 magnesium oxide used and the metal ratio desired because a larger amount of water results in a product having a higher metal ratio. Depending upon the end use of the product, it may be acceptable for the product to be hazy if used, for example, in bunker fuel oils and the like; however, higher  
35 clarity products are required in lubricating oils.

The alcohols used in this process include lower aliphatic alkanols, alkoxy alkanols, and mixtures thereof, where the number of carbon atoms does not exceed 5. Examples of the

alcohols include methanol, ethanol, isopropanol, n-propanol, butanol, and pentanol. The preferred alcohol is methanol because of the low cost and ease of removal from the reaction mixture. Examples of the alkoxy alkanols include  
5 methoxy ethanol and ethoxy ethanol.

In order to initiate absorption of the acidic gas in the reaction mixture, it is not necessary to have an alcohol present in the initial mixture. It is believed, however,  
10 that the primary function of the alcohol is to promote the stability of the colloidal dispersion of magnesium salts in the oil. To this end there may be none or a small amount of alcohol in the initial reaction mixture and during the contacting with the acidic gas further amounts of alcohol are  
15 added either separately or in combination with the addition of water. It has been found that lower metal ratios result if the total amount of alcohol to be added exceeds 35 equivalents per equivalent of sulphonic acid. The preferred amount to be used ranges from 4 to 20 equivalents per equivalent  
20 of sulphonic acid.

#### Sulphonic Acids

The sulphonic acids to be used in this process are those which are widely known by those skilled in the art as oil-  
25 soluble sulphonic acids. Such compounds may be derived from natural petroleum fractions or various synthetically prepared sulphonated compounds. Typical oil-soluble sulphonic acids which may be used include:

30 alkane sulphonic acids, aromatic sulphonic acids, alkaryl sulphonic acids, aralkyl sulphonic acids, petroleum sulphonic acids such as mahogany sulphonic acid, petroleum sulphonic acid, paraffin wax sulphonic acid, petroleum naphthene sulphonic acid, polyalkylated sulphonic acid, and other types of sulphonic acids which  
35 may be obtained by fuming sulphuric acid treatment of petroleum fractions.

It is understood, of course, that mixtures of the sulphonic acids may be used in preparing an over-based magnesium sulphonate.

The process according to this invention is operative with low sulphonate concentrations which thereby allows the use of oil-based feed stock compositions containing as little as 10% by weight of magnesium sulphonate without further concentration of the oil-based stock.

Acidic Gas

As is appreciated by those skilled in the art, various types of acidic gases may be used in over-basing magnesium sulphonates. The preferred acidic gases are carbon dioxide, sulphur dioxide, nitrogen dioxide, and hydrogen sulphide. These gases are bubbled through the reaction mixture as it is being mixed so that the selected gas or gases become intimately mixed and in contact with the components of the reaction mixture.

The temperatures at which the contacting of the gas with the reaction mixture according to a preferred embodiment may vary from 10 to 93.3°C (50 to 200°F), although preferably within the 48.9 to 76.7°C (120 to 170°F) range.

Magnesium Oxide

The type of magnesium oxide used in a preferred embodiment of the process is the light or active form. Such magnesium oxides are sold under the Trade Marks: MAGNESITE, available from Martin Marietta Chemicals, Hunt Valley, Maryland; MICHIGAN No. 3, MICHIGAN No. 15, MICHIGAN No. 340, available from Michigan Chemical Corporation, Chicago, Illinois; DOW L-2, DOW C-1, available from Dow Chemical Co., Midland, Michigan; ELASTOMAG 170, and ELASTOMAG 20, available from Morton Chemical Co., Chicago, Illinois; MAGLITE Y, available from Whittacker, Clark and Daniels, South Plainfield, New York; LYCAL 93/711, and LYCAL 96/575 available from Pigment and Chemicals, Toronto, Canada; and MAGOX PREMIUM, available from Basic Chemical, Cleveland, Ohio. The amount of magnesium oxide used is dependent upon the metal ratio desired in the final product. The metal ratio is the ratio of the number of equivalents of magnesium in the over-based compound to the equivalents of sulphonic acid in the over-based

compound. Therefore, to obtain a metal ratio of, for example, 30, there must be at least thirty equivalents of magnesium oxide per equivalent of sulphonic acid in the initial reaction mixture. It is apparent that when the re-  
5 action is carried out under less favourable conditions at lower efficiencies, an excess of magnesium oxide beyond that determined by the metal ratio should be used to ensure sufficient incorporation of magnesium with the structure of the over-based magnesium salt of the sulphonic acid.

10

Inert Diluents

Several different types of volatile and non-volatile diluents may be used in this process. The non-volatile diluents are generally mineral or synthetic lubricating oils, such as  
15 lubricating oils having a viscosity around 100 SUS at 37.8°C (100°F) or higher. The volatile diluents which are inert to the reaction are preferably hydrocarbons with boiling points ranging from 65.6 to 148.9°C (150 to 300°F). These can be aliphatic, aromatic, or a mixture of both types of solvents.  
20 For example, naphtha is a particularly useful diluent. Other types of suitable diluents include Stoddard solvent, cycloaliphatic and aromatic hydrocarbons, and corresponding halogenated hydrocarbons, such as chlorobenzene, and other conventional organic diluents generally employed in the  
25 over-basing procedures in this particular art of manufacture. The amount of diluents used is sufficient to lower the viscosity of the reaction mixture to facilitate mixing thereof during the introduction and contacting of the acidic gases with the mixture.

30

The length of time that the acidic gas is contacted with the reaction mixture depends upon the desired level of magnesium in the over-based magnesium sulphonate. The contacting of the gas with the mixture may be continued until no further  
35 gas is absorbed to indicate that substantially all of the magnesium oxide originally introduced into the system has been reacted to form an over-based magnesium sulphonate.

To determine when the absorption of the gas is complete, the flow rate of the acidic gas being introduced is compared to the flow rate of the gas leaving the system. When the flow rate of leaving gas almost equals the flow rate of the introduced gas, then the absorption is substantially complete.

As can be appreciated by those skilled in the art, impurities and other variations in the selected petroleum feed stocks and magnesium oxides, according to this invention, can cause the resultant product to have slightly different metal ratios than that achieved in the following examples. These examples are intended to illustrate various aspects of the invention and are not intended to limit the scope of the invention in any way.

15

#### Preparation 1

An oil-soluble magnesium sulphonate was prepared by charging into a 1 litre reactor, equipped with stirrer, dropping funnel, thermometer, cooling and vent, 310 gm. of a solvent refined lubricating oil having a viscosity of 330 SUS at 37.8°C (100°F) and while stirring vigorously, 103 gm. of 25 percent by weight oleum was added dropwise over a half hour period. The temperature was maintained at 32.2 to 43.3°C (90 to 110°F). The mixture was stirred for an additional 10 minutes and then quenched with 25 gm. water, 310 gm. VM&P naphtha was added and the mixture allowed to settle in a separatory funnel for 3 hours; 80 gm. spent acid was separated and removed. The organic naphtha layer was washed with 120 gm. water and the aqueous lower yellowish layer was separated and discarded. To the upper sulphonic acid/naphtha layer was added 100 gm. water, 10 gm. methanol and 8 gm. magnesium oxide. The mixture was stirred at 60°C (140°F) effecting neutralisation of the sulphonic acid and allowed to stand. The bottom aqueous layer which separated was discarded and the naphtha layer was stripped of solvent and water to give a 30 wt.% solution of magnesium sulphonate in oil.

Example 1

Into a 1000 ml. flask fitted with mechanical stirrer, thermometer, condenser, dropping funnel and a coarse cylindrical dispersion tube were charged 85 gm. of the magnesium sulphate of Preparation 1, 25 gm. lubricating oil of 100 SUS viscosity at 37.8°C (100°F), 140 gm. naphtha and 30 gm. magnesium oxide (MAGNESITE No. 569). The mixture was heated to 54.4°C (130°F) and 6 gm. magnesium acetate was added. Heating was continued, and at 60°C (140°F) a mixture of water/methanol of 20 gm/16 gm. respectively was added dropwise through the dropping funnel over a period of 66 minutes. At the same time carbonation was initiated at 75 ml/min. and continued for 3 hours.

The product of carbonation was then filtered with the aid of diatomaceous filter aid. Water, methanol and naphtha were then stripped off by heating to 204.4°C (400°F) leaving a product which was clear and bright with a magnesium content of 9.2% which is equivalent to a metal ratio of 27.0.

20

Example 2

The following reagents were mixed together in a 1000 ml flask fitted with mechanical stirrer, thermometer, condenser and a coarse cylindrical dispersion tube:

137g naphtha (B.P. 115.6-143.3°C (240-290°F))  
8g methanol  
4g water  
32g lubricating oil  
100 gm magnesium sulphate solution made up of 45% magnesium sulphate, 42% lubricating oil, and 13% naphtha. The sulphonic acid used to make the magnesium sulphate is a straight chain alkyl benzene sulphonic acid of molecular weight about 500 which may be obtained from Continental Oil

30g magnesium oxide sold under the Trade Mark MAGNESITE No. 569 available from Martin Marietta Co. (USA) and  
5.25g glacial acetic acid.

25

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35

The mixture was heated near its reflux temperature 65.6°C (150°F) and carbon dioxide was introduced while mixing via the dispersion tube into the mixture at a flow rate of 100 ml/min. Carbonation was continued for 2-1/2 hours, during  
5 which 8 gm. water and 8 gm. methanol were added after 40 minutes of carbonation and further 4 gm. of water and 8 gm. methanol were added after 80 minutes of carbonation.

The product of the carbonation was filtered with the aid of  
10 diatomaceous filter aid. The volatile components of solvent, water, methanol and naphtha were stripped off by heating to 204.4°C (400°F). A stream of CO<sub>2</sub> was introduced to the heated mixture to remove the last traces of solvents. The  
15 final product thus obtained was a clear and bright oil soluble solution which contained 9.4% by weight magnesium, 26.5% by weight magnesium sulphate and had a viscosity of 525 SUS at 98.9°C (210°F). The metal ratio of the product was 14.8.

20

Example 3

This example illustrates the effect of temperature during carbonation. The exact procedure of Example 2 was followed except that the mixture was maintained at 32.2 to 43.3°C (90 to 110°F) during carbonation. The final product was a  
25 clear and bright oil soluble solution which contained 6.9% by weight magnesium, 26.9% by weight magnesium sulphate. The metal ratio of the product was 10.7.

Examples 4 to 7

30 The results of a series of experiments are listed in Table 1 which illustrates the effect on the metal ratio in varying the amounts of methanol and water used during the carbonation step. The procedure is as for Example 2 with water/methanol additions made at 0, 40 and 80 minutes during the  
35 carbonation step.

TABLE 1

Example	Time of Water/Methanol Addition During Carbonation Minutes	Water gm.	Methanol gm.	Metal Ratio	% Mg. by Wt. of Product	Appearance	
5	4	0	8	16	16.3	9.8	Hazy
		40	8	8			
	10	80	8	8			
5		0	4	16	15.7	9.4	Hazy
		40	8	8			
		80	8	8			
15	6	0	4	8	16.3	9.8	Hazy
		40	8	8			
		80	8	8			
20	7	0	4	8	16.0	9.7	Bright and Fluid
		40	8	8			
		80	4	8			
25	<u>Examples 8 to 11</u>						

Table 2 summarises results of a series of experiments which illustrate the effect of adding the water/methanol at different time intervals. The procedure used in each experiment is similar to that used in Example 2.

TABLE 2

Example	Time of Water/ Methanol Addition During Carbonation Minutes	Water gm.	Methanol gm.	Metal Ratio	% Mg. by Wt. of Product	Appearance	
5	8	0	4	8	15.5	9.3	Slight Haze
		30	8	8			
	10	60	4	8			
15	9	0	4	8	15.5	9.3	Bright and Fluid
		40	8	8			
		80	4	8			
20	10	0	4	8	14.7	8.8	Bright and Fluid
		50	8	8			
		100	4	8			
25	11	0	4	8	14.2	8.5	Bright and Fluid
		60	8	8			
		120	4	8			

Examples 12 to 23

This series of experiments illustrate the effect of the amount of promoter used in terms of product quality. The results of these experiments are summarised in Table 3. The procedure for each experiment is similar to that used in Example 2.

TABLE 3

Example	Promoter: No. of Equivalents of (AcOH) per Equivalent of Sulphonic Acid	Metal Ratio	%Mg. by Wt. of Product	Appearance	Viscosity SUS at 98.9°C (210°F)	
5	12	0	.5	--	Bright	--
	13	.51	13.6	--	Bright	--
	14	.68	15.5	9.3	Bright	750
10	15	.68	15.5	9.3	Bright	1200
	16	.68	15.5	9.3	Bright	1700
	17	1.02	15.7	9.4	Bright	525
	18	1.02	15.8	9.5	Bright	560
	19	1.02	15.7	9.4	Bright	525
15	20	1.56	16.0	9.7	Bright	630
	21	1.56	16.3	9.8	Bright	660
	22	1.56	15.7	9.4	Bright	500
	23	1.87	15.7	9.4	Hazy	Viscous gel

Examples 24 to 29

20 Table 4 summarises the results of a series of experiments which illustrate the use of different promoters. All conditions of the procedure in each experiment are similar to that used in Example 2 except for using an equivalent molar amount of the different promoters as listed.

TABLE 4

Example	Promoter	Metal Ratio	Appearance
24	Acetic Acid	16.3	Bright, clear; fluid product
25	Glycine	14.7	Bright, clear; fluid product
30	26 Formic Acid	.7	Hazy; fluid
	27 Ammonium Acetate	--	Did not absorb CO <sub>2</sub>
	28 Benzoic Acid	10.9	Viscous to solid
	29 Ethylene Diamine Di-formate	11.2	Bright, clear; fluid

Examples 30 to 33

These examples illustrate how the sulphonic acids affect the product quality when using this process for production of magnesium containing lubricating oils. The results of the experiments are summarised in Table 5. The procedure of each experiment is similar to that used in Example 2.

TABLE 5

Example	Source of Magnesium Sulphonate Used	Basic Structure & Approximate Molecular Weight	Metal Ratio	Appearance
30	prepared from Union Carbide "Ucane H.A."	Straight Chain Alkyl Benzene M.W. 410	16.0	Clear, bright; fluid
31	prepared from Continental Oil LMR6 Alkylate	Straight Chain Alkyl Benzene M.W. 400	16.5	Clear, bright; fluid
32	Esso France SA 119	Branched Chain Alkyl Benzene approx. M.W. 430	15.8	Very viscous, heat promotes viscosity increase until product became solid
33	Edwin Cooper Sulphonic acid	Straight Chain Alkyl Benzene M.W. 380	15.7	Low viscosity product, slight haze in hexane solution

Examples 34 to 46

The results of these experiments are summarised in Table 6 to illustrate the effect on the product obtained by using different commercially available magnesium oxides. The procedure in each experiment is similar to that of Example 2.

TABLE 6

Example	Source of Magnesium Oxide	Metal Ratio	Appearance
5	34 Magnesite 369	17.4	Viscosity increase during reaction; product very hazy
	35 Magnesite 569	17.1	Bright and fluid
	36 Michigan No. 3	17.3	Viscous during reaction
	37 Michigan No. 15		Solidifies during reaction
	38 Dow L-2	18.6	Increase in viscosity during reaction; product hazy
10	39 Dow C-1	14.5	Viscosity increase during initial stage of reaction; product excellent
	40 Elastomag 170	16.7	Viscosity increase during initial stages of reaction; product hazy
15	41 Magox Premium	..	Solidifies during reaction
	42 Licothion Tab (China)		Viscosity increase during reaction; solidifies on stripping
	43 Elastomag 20	17.8	Viscosity increase during initial stage of reaction; product hazy
20	44 Maglite Y	16.9	Hazy product
	45 Lycal 93/711	12.2	Product hazy
	46 Lycal 96/575		Solidifies during reaction

Examples 47 to 49

25 These experiments illustrate the use of different lower alcohols in the procedure of Example 2. The results of the experiments are summarised in Table 7.

TABLE 7

Example	Alcohol	Metal Ratio	Appearance
30	47 Isoproponal	12	Slight haze, and fluid product
	48 N-pentanol	8	Slight haze, and fluid product
	49 Methoxy ethanol	12	Hazy and fluid product

It can be appreciated from the results of these experiments that high quality, over-based magnesium salts of sulphonic acids may be manufactured and used as additives in lubricating oils, greases and other types of oil-based products, such as fuel oils, bunker oils, etc., where the metal ratio of the additives are in the range of 5 to 40. The products are permanently soluble in many organic environments and therefore find application as additives in the field of lubricants and fuels.

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Although various preferred embodiments of the invention have been described herein in detail, it will be appreciated by those skilled in the art that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

15

## CLAIMS:-

1. A process for preparing an over-based oil-soluble magnesium salt of a sulphonic acid having a metal ratio of equivalents of magnesium to equivalents of sulphonic acid of from approximately 10 to approximately 40; comprising contacting an acidic gas with a mixture comprising:

(a) an oil-soluble magnesium salt of a sulphonic acid,  
10 (b) from approximately ten equivalents up to approximately 40 equivalents of a light magnesium oxide per equivalent of sulphonic acid,

(c) a promoter system comprising:

15 (1) from approximately 0.5 to approximately 5 equivalents of an essentially oil-insoluble carboxylic compound per equivalent of sulphonic acid, said compound being selected from the group of compounds consisting of lower carboxylic acids, lower carboxylic anhydrides,  
20 substituted lower carboxylic acids, and mixtures thereof, all having from 1 to 5 carbon atoms,

25 (2) from approximately 2 to approximately 30 equivalents of water per equivalent of sulphonic acid, and

30 (3) from 0 to approximately 35 equivalents of an alcohol per equivalent of sulphonic acid, said alcohol being selected from the group of components consisting of lower alkanols, lower alkoxy alkanols and mixtures thereof, all having from 1 to 5 carbon atoms, and

(d) an inert solvent for lowering the viscosity of said mixture to facilitate mixing;

said contacting being conducted at a temperature 35 ranging from approximately 10°C (50°F) up to reflux temperature of said mixture and the volatile components being stripped from the reaction mixture after absorption of the acidic gas by the reaction mixture is at a desired level to give an over-based, oil-soluble magnesium salt of a sulphonic acid.

2. A process according to Claim 1 wherein said contacting is carried out at a temperature of from 10°C to 93.3°C (50°F to 200°F).
- 5
3. A process according to Claim 2 in which said contacting is carried out at a temperature of from 48.9°C to 76.7°C (120°F to 170°F).
- 10
4. A process according to Claim 1, 2 or 3 in which the acidic gas is contacted with the mixture until absorption of the gas by the mixture is essentially complete.
5. A process according to any one of the preceding claims in  
15 which the promoter system includes from approximately 0.5 to approximately 3 equivalents of the essentially oil-insoluble carboxylic compound per equivalent of sulphonic acid.
6. A process according to any one of the preceding claims  
20 wherein approximately 0.7 to 1.3 equivalents of the carboxylic compound are used.
7. A process according to any one of the preceding claims wherein the initial amount of water is less than 30 equivalent  
25 lents and additional water is added to the mixture during the time that acidic gas is contacted with the mixture to bring the total amount of water used to not more than 30 equivalents per equivalent of sulphonic acid.
- 30
8. A process according to any one of the preceding claims wherein an initial amount of selected alcohol is present in said mixture sufficient to initiate absorption of the acidic gas and an additional amount of alcohol is added to said  
35 mixture during the time that the acidic gas is contacted with the mixture to bring the total amount of alcohol used to not more than 35 equivalents per equivalent of sulphonic acid.

9. A process according to any one of the preceding claims wherein said acidic gas is selected from the group consisting of carbon dioxide, sulfur dioxide hydrogen sulfide and nitrogen dioxide.
10. A process according to any one of the preceding claims wherein said acidic gas is carbon dioxide.
11. A process according to any one of the preceding claims wherein the amount of water present in the mixture prior to contacting the mixture with acidic gas ranges from approximately 2 to approximately 15 equivalents.
12. A process according to any one of the preceding claims wherein the amount of water present in the mixture prior to contacting the mixture with carbon dioxide gas ranges from approximately 2 to approximately 8 equivalents.
13. A process according to any one of the preceding claims wherein the total amount of alcohol used ranges from approximately 4 to approximately 20 equivalents.
14. A process according to any one of the preceding claims wherein said alcohol is selected from the group consisting of methanol, ethanol, isopropanol, n-propanol, butanol, pentanol, methoxy ethanol, and thoxy ethanol.
15. A process according to any one of the preceding claims wherein said carboxylic compound is represented by the formula:
- $$\text{XCOOY}$$
- wherein X is H,  $-\text{CH}_2\text{OH}$ ,  $-\text{CH}_2\text{Cl}$ ,  $-\text{CH}_2\text{Br}$ ,  $-\text{CH}_2\text{COCH}_3$ , R, or  $\text{NRH}_2$  and Y is H, R, or  $\text{M}^n$  where R is an alkyl radical of from 1 to 4 carbon atoms, the sum of all the carbon atoms in the R radicals not exceeding 5 and  $\text{M}^n$  is an alkali or alkaline earth metal atom wherein n is an integer of from 1 to 2.

16. A process according to Claim 15 wherein said carboxylic  
compound is selected from the group consisting of acetic  
acid, propionic acid, butanoic acid, glycine, chloroacetic  
5 acid, bromoacetic acid, glycolic acid, ethyl acetoacetate,  
sodium acetate, calcium acetate, magnesium acetate and  
mixtures thereof.

17. An overbased, oil-soluble magnesium salt of sulphonic  
10 acid having a metal ratio of from approximately 10 up to  
approximately 40 prepared by the process according to any  
one of the preceding claims.



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>US - A - 3 609 076</u> (A.R. SABOL) * Claims 1-8; column 3, lines 1-60 *</p> <p>--</p> <p>CHEMICAL ABSTRACTS, vol. 84, nr. 13, June 28, 1976, abstract 182354h. Columbus, Ohio, USA ANTONOV, V. et al. "High-alkaline sulfonate additive", page 124, 2nd column.</p> <p>&amp; SU - A - 502 930</p> <p>--</p> <p>A <u>US - A - 3 446 736</u> (R.S. HERD)</p> <p>A <u>US - A - 2 839 470</u> (G.E. WARREN)</p> <p>A <u>US - A - 3 027 325</u> (R.L. McMILLEN)</p> <p>A <u>GB - A - 1 100 985</u> (MOBIL OIL)</p> <p>----</p>	<p>1-6, 9-17</p> <p>1,5,6 15-17</p>	<p>C 07 C 143/00 C 10 M 1/42 C 10 L 1/24</p>
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			<p>C 10 M 1/08 C 07 C 143/00</p>
			CATEGORY OF CITED DOCUMENTS
			<p>X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons</p>
			&: member of the same patent family, corresponding document
<p><input checked="" type="checkbox"/> The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
The Hague	23-07-1979	RO TSAERT	