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WATER BASE LUBRICANTS

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5 Claims. (Cl. 252—49.3)

ABSTRACT OF THE DISCLOSURE

In fields where metal surfaces are brought into abrasive wear contact, as, for example, in pumps used for pumping water and devices on which cutting fluids are employed, a bis-(2-hydroxyethyl) aliphatic amine oxide is introduced into water to provide lubricity for the metallic wear surfaces. The amine oxide may be used in the proportion of 80–200 parts of the oxide per million parts of water. It is preferred to use 80–100 parts of bis-(2-hydroxyethyl) hydrogenated tallow amine oxide or bis-(2-hydroxyethyl) coco amine oxide and 125–150 parts of bis-(2-hydroxyethyl) octadecyl amine oxide per million parts of water.

This invention relates to water base lubricants and to a process for imparting lubricity to aqueous systems.

In various fields where lubricants are required, it is found that mineral oils are not satisfactory. For example, in aqueous systems such as are present in the pumping of water into the ground for secondary oil recovery, there is a tendency for the oil to plate out on the pump. In the use of oils as cutting fluids, it is often time-consuming to remove the oils from the products. Further, mineral oils sometimes present a fire hazard and often form emulsions and are not compatible with some additives used in the systems.

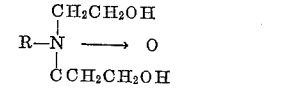
We have discovered water base lubricants, which may be free of mineral oil, and which impart excellent lubricity in aqueous systems. For example, in the pumping of water in secondary oil recovery systems, the parts remain water wet and there is no oil to plate out during the operation. Further, the water base lubricant is non-inflammable and is compatible with anti-freeze materials, corrosion inhibitors, thickeners, and other desirable additives for the water base lubricant. Mineral oil may be omitted entirely, so that there is no danger of rancidity or the forming of sludge or other degradation products.

A primary object, therefore, is to provide a water base lubricant having excellent lubricity and the above-described desirable characteristics. A further object is to provide a process for imparting lubricity to aqueous systems by means which do not require the addition of mineral oil. A still further object is to provide a lubricant consisting of water and a relatively small amount of non-mineral oil ingredients which provides lubricity and which is compatible with anti-freeze ingredients, corrosion inhibitors, thickeners, etc. Yet another object is to provide a water base lubricant useful as a cutting fluid and which enables the parts, after being cut, to be readily cleaned by the addition of water. Other specific objects and advantages will appear as the specification proceeds.

In one embodiment of our invention, we mix with water bis(2-hydroxyethyl) aliphatic amine oxide in which the aliphatic hydrocarbon group has from 8 to 22 carbon atoms, or mixtures thereof, the oxide concentration being at least 80 parts per million parts of water by weight. The preferred concentration is 100 parts of the oxide per million parts of water, and the upper limits of the oxide proportion are not critical. We may use 200 parts of the oxide, or more, per million parts of water.

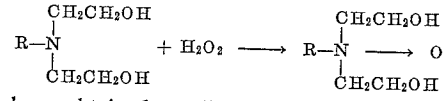
We have obtained best results in preparing the aliphatic bis-hydroxyethyl amine oxides where the aliphatic hydrocarbon group has from 12 to 18 carbon atoms.

The structure of the amine oxides may be set out as follows:



where R is an aliphatic hydrocarbon group having from 8 to 22 carbon atoms and mixtures thereof. The carbon atoms may be straight chain, branched, and unsaturated.

The preparation of the oxides by the reaction with hydrogen peroxide may be described as follows:



We have obtained excellent results by combining with water in proportions of 80 to 100 parts thereof per million parts of water, bis-(2-hydroxyethyl) hydrogenated-tallow amine oxide. Similarly, we have obtained good results by combining with water in similar proportions bis-(2-hydroxyethyl) coco amine oxide. Another specific example is bis-(2-hydroxyethyl) octadecyl amine oxide. In the foregoing, it will be noted that the aliphatic radical may have 8 or more carbon atoms and may contain a mixture thereof, including mixtures from natural oils, such as coconut, tallow, etc.

When the water base lubricant has been prepared as above described, other additives may be added as, for example, anti-freeze materials consisting of low molecular weight glycols, such as ethylene glycol, propylene glycol, etc., low molecular weight alcohols, such as methanol, etc. Also, thickeners such as carboxymethyl cellulose, alginates, polyvinyl pyrrolidone, etc., may be added and the lubricant is compatible therewith. Similarly, water corrosion additives may be employed, and these are compatible with the water base lubricant. If desired, such additives may be omitted.

Comparative tests made with the bis-(2-hydroxyethyl) aliphatic amine oxides as described herein with other tertiary amine oxides show that the ethoxylated or ethylene oxide-reacted products furnish high lubricity in aqueous systems while the other tertiary amine oxides are not thus effective. Further, while substantial results are obtained at low concentrations, such as 80 parts of the oxide per million parts of water, improved results are obtained at higher concentrations, such as 100 parts of bis-(2-hydroxyethyl) coco amine oxide and bis-(2-hydroxyethyl) hydrogenated-tallow amine oxide, and preferably 125 to 150 parts per million parts of water of bis-(2-hydroxyethyl) octadecyl amine oxide. A specific comparison is set out in the accompanying examples, which are illustrative of the process and products.

Example I

Tests were made on a Baroid mud tester, which is similar to a Timken wear tester. A standard test procedure was followed wherein the test block was mounted on a torque arm of the apparatus and brought into contact with the ring mounted on a shaft, which is rotated at a constant speed. In each test, one side of the block was forced against the test ring at a specified torque for a specified time. During the test, both the block and ring were immersed in the solution containing the lubricating agent at the specified concentration. The test block was weighed before and after the test to determine the weight. If galling or seizing occurs, the test is discontinued. The "torque" controls the force applied by the test block against the ring and is measured on the torque arm. A two-hour test

as described above was carried out using tap water and the chemical described and with the concentration and wear results indicated in the following Table I. The chemicals are trade names which are defined as follows:

Aromox C/12 is bis-(2-hydroxyethyl) cocoamine oxide
Aromox T/12 is bis-(2-hydroxyethyl) tallowamine oxide
Aromox 18/12 is bis-(2-hydroxyethyl) stearylamine oxide
Aromox DMCD is dimethylcocoamine oxide
Aromox DMHTD is dimethyl hydrogenated-tallowamine oxide
Aromox DM16D is dimethylhexadecylamine oxide

As stated, the conditions and results are set out as follows:

TABLE I

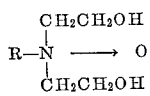
Chemical	Concentration (p.p.m.)	Wear (mg.) at 40"/lb. Torque
Aromox C/12 Oxide	100	1.0
Aromox C/12	80	2.9
Aromox T/12 Oxide	100	1.8
Aromox T/12	80	105.6
Aromox 18/12 Oxide	150	1.8
Aromox 18/12	100	121.3
Aromox DM16D Oxide	120	93.8
Aromox DM16D	100	94.0
Aromox DM16D	80	93.0
Aromox DMCD Oxide	200	84.7
Aromox DMCD	80	149.2
Aromox DMHTD Oxide	80	*Excessive

* Test discontinued because of excessive wear and noise.

While in the foregoing specification, we have described products and procedures in considerable detail for the purpose of illustrating our invention, it will be understood that such detail or details may be varied widely by those skilled in the art without departing from the spirit of our invention.

We claim:

1. In a process in which metal surfaces are brought into abrasive wear contact, the step of circulating over the wear surfaces water containing per million parts of the water about 80–200 parts of an amine oxide having the following structure:



where R is an aliphatic hydrocarbon group having from 8 to 22 carbon atoms and mixtures thereof.

2. The process of claim 1 in which the aliphatic hydrocarbon group has from 12 to 18 carbon atoms.

3. The process of claim 1 in which the amine oxide is bis-(2-hydroxyethyl) hydrogenated tallow amine oxide and is employed in the proportion of 80–100 parts per million parts of water.

4. The process of claim 1 in which the amine oxide is bis-(2-hydroxyethyl) coco amine oxide and is employed in the proportion of 80–100 parts per million parts of water.

5. The process of claim 1 in which the amine oxide is bis-(2-hydroxyethyl) octadecyl amine oxide and in which the proportion is 125–150 parts thereof per million parts of water.

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