

# UNITED STATES PATENT OFFICE

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## REACTION PRODUCT OF A XANTHATE, AN INORGANIC SULFIDE, AND A COPPER SALT

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1

This invention relates to an organic composition of a metal, such as copper, that is soluble in oil and various organic solvents, and to the preparation of such a composition.

Various compounds of copper have been prepared heretofore which are organic in nature and relatively soluble in oils and various solvents, but which are relatively insoluble in water. Compounds of this nature have various useful applications; e. g., such copper compounds as copper resins and naphthenates are commonly used as fungicides or preservatives for impregnating wood, cloth, and in various agricultural sprays. A compound of the oil soluble type applied to a surface exposed to the weather is usually more effective because of its greater resistance to the washing and leaching action of the rain. This is true whether the product is applied to the leaves of plants for the control of fungus infections, or whether the product is applied to wood, such as piling that is driven into wet ground or exposed to the weather above ground.

Such oil soluble organic compounds of copper, however, either have been soluble only to a limited extent, or have contained very little copper in proportion to their total weight. Thus, it has been only in rare instances, heretofore, that such a copper compound could be made to form a solution containing as much as 10% of copper, the active fungicidal constituent.

It is an object of this invention to provide a composition that consists essentially of a compound or mixture of compounds of copper, that contains as much as 50% or more of the metal and that can be dissolved to form solutions in hydrocarbon oils containing as much as 40% of copper.

It is a further object of this invention to provide a process of preparing such compositions by a relatively simple reaction and by the use of relatively inexpensive and easily prepared solutions.

The products of my invention are prepared by reacting in solution, preferably aqueous solution, a xanthate and a sulfide with a salt or compound of copper. As a practical matter it is best to use cuprous salts. The higher valence or oxidized forms of the compounds could be used, but if cupric compounds are employed, they would first be reduced by the action of the sulfide and xanthate so that the final reaction in any case would take place between the sulfide-xanthate mixture and the cuprous compound. It is much better, therefore, as a practical mat-

2

ter to start with the lower valence type of compound.

It is not known whether the reaction product thus obtained is a single compound or a mixture of different individual compounds. At any event, the reaction product is a complex sulfide-xanthate composition that differs from previously known organic metal compounds of this type in its solubility in oils, alcohols and hydrocarbon solvents. The product is amorphous in nature and forms an oil solution of an intense and deep red color. Such a solution of the copper product when spread upon a surface so that the solvent is evaporated, forms a brittle, resinous film which has a semi-metallic lustre.

The compositions of my invention are preferably made by using a mixture of xanthate and sulfide in approximately the ratio of 3 mols of sulfide for each 2 mols of xanthate. From 2 to 4 mols of sulfide can be used for each 2 mols of xanthate with good results although the best solubility is obtained with the 3 to 2 ratio. For best results, the amount of copper compound employed should be approximately equivalent to the combined amount of the xanthate and sulfide. In the case of cuprous compounds I consider each atom of copper as equivalent to one mol of xanthate, or to one-half mol of sulfide.

I have also found that in order to obtain the best products it is highly desirable to use a xanthate that is purified in some manner before the reaction with the copper compound takes place. If an impure or commercial type of xanthate product is used, the efficiency of the reaction is very low and even less than half of the copper in the product may be soluble.

The following specific example is given to illustrate my invention although it is to be understood that the reaction can be carried out in any kind of a solution, and by a reaction in which the components are combined in one batch at a time or continuously.

*Example I.*—A purified water soluble xanthate was first prepared from a saturated solution in water of a commercial potassium methyl isobutyl carbinol xanthate. Sodium chloride crystals were added to this saturated xanthate solution over a period of two hours with agitation at room temperature until the solution had been saturated with the sodium chloride. A slurry was thus formed which contained the crystallized xanthate salt that had separated from the solution, leaving the impurities in the solution. These xanthate crystals were then separated by centrifuging and washed with a saturated solu-