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WOOD PRESERVING COMPOSITION

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This invention is concerned with improvements in or relating to wood preservative compositions in powder form and is more particularly concerned with such wood preservatives as contain arsenic compounds.

The use of arsenic compounds in wood preservative compositions is well known and in particular the use of compositions containing arsenic pentoxide, an alkali metal dichromate and copper and/or zinc salts has been proposed.

The use of arsenic pentoxide in free form, has however been known to give rise to various difficulties, thus, for example, arsenic pentoxide is difficult to handle by virtue of its tendency to deliquesce, its use is attended by health hazards, and the material cannot be ground readily to a fine powder.

Initially dry compositions containing arsenic pentoxide, in free form, and one or more ingredients containing loosely combined water, for example copper sulphate penta-hydrate, in general quickly liquefy or become pasty even when packed in air-tight containers. Thus such a composition when packed in drums or other containers, becomes in general, virtually impossible to handle satisfactorily even after a short storage period. Thus not only are the handling difficulties increased but the health hazards are likewise increased. The reason for this change in state has been traced to the interchange of water between compounds with loosely combined water (as water of crystallisation), for example copper sulphate penta-hydrate, and the very deliquescent arsenic pentoxide. The rate of interchange of the water is promoted by increasing the temperature on storage, for example the rate of interchange will be much greater in tropical conditions than in more temperate climates.

By "compound with loosely combined water" I mean compounds such as, for example, copper sulphate penta-hydrate, which can lose a proportion of their water of crystallisation at temperatures of, for example, 20° C. and in particular at temperatures of 35–40° C., that is temperatures which can be experienced in tropical or subtropical areas, in which the preservative might either be stored or through which it might be transported. In the presence of a deliquescent compound such as sodium dichromate or arsenic pentoxide the loss of water from, for example, copper sulphate penta-hydrate is accelerated with the result that the mixture will agglomerate or become a paste.

As a result the use of compositions containing arsenic pentoxide, in free form, copper salts and chromates and/or dichromates has not developed to any great extent, although there are clear indications that such preparations would be advantageous from a preservative point of view.

Previously the above mentioned disadvantages have been reduced to some extent by obtaining the several ingredients separately and making up the preservative at the time of use. Such a procedure is, however, inconvenient and may, inter alia, give rise to incorrect mixing of the ingredients and hence poor treatments. A further

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disadvantage is that the plant operator is exposed to the health hazards associated with the use of arsenic pentoxide either in solid or liquid form. Again these disadvantages have also been in part reduced by manufacturing a concentrated solution. Such a procedure offers certain problems on storage and the concentrated solution is not as easy to handle as the free flowing powder at the treatment plant. Moreover the handling of a concentrated liquid containing arsenic pentoxide has been found to subject the plant operator to health hazards.

It is an object of the present invention to provide a wood preservative containing arsenic in the form of a free flowing powder wherein the above-mentioned disadvantages are reduced and which, for a reasonable time, remains in a form, which can be handled more readily, particularly at the treatment plants, than hitherto known compositions containing arsenic.

My investigations have shown that alkali metal arsenates of a certain type hereinafter referred to as "low pH alkali arsenate free flowing powder" may be conveniently used in the formulation of a wood preservative in powder form with improved results from the above-mentioned point of view.

I use the term "low pH alkali arsenate free flowing powder" to designate an alkali metal or ammonium arsenate, preferably a sodium arsenate which in 1.2 w./v. aqueous solution gives rise to a pH of less than 4.6, preferably less than 3.6, but not less than 2.0. The symbol w./v. indicates weight/volume on the metric scale.

Various grades of "low pH alkali arsenate free flowing powder" can be prepared and I prefer to employ a low pH sodium arsenate free flowing powder containing from 60–70% by weight of combined arsenic calculated as arsenic pentoxide (As_2O_5) based on an oven dry weight at 100° C. It is to be noted that it may be desirable to add to the low pH alkali arsenate free flowing powder, during its manufacture, or at a later stage, various diluents in order to regulate the characteristics, such as the pH and consistency, of the final product. Thus it has been found to be advantageous to add sodium sulphate to the low pH sodium arsenate free flowing powder to facilitate grinding. The incorporation of sodium bisulphate has also been found to be advantageous in facilitating the production of a free flowing powder and for regulating the pH of the preservative composition.

Such low pH arsenates can be prepared as free flowing powders and have a lesser tendency to pick up moisture than arsenic pentoxide.

Accordingly the invention comprises a wood preservative composition in a powdered free flowing form adapted to be dissolved in water prior to use for wood preservation comprising in admixture a low pH alkali arsenate free flowing powder as above defined together with a non-deliquescent copper and/or zinc salt and one or more of the following substances, namely potassium dichromate, ammonium dichromate and anhydrous sodium dichromate.

It is preferred that the wood preserving composition according to the invention should not contain any deliquescent compounds.

The term "deliquescent" as used herein is used to designate such compounds for example as arsenic pentoxide or sodium dichromate which may absorb moisture from the surrounding atmosphere to such an extent that they become liquified.

A wood preservative composition according to the present invention may also contain other compounds which have a preserving action. Such compounds are, for example, sodium hydrogen fluoride, dinitrophenol and the cresols; the addition of sodium bisulphate may also be desirable to lower the pH of the solution which results from the addition of water to the composition.

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By restricting the pH of the compositions according to the invention to not less than 2.0 or 2.1 it has been discovered that in addition to the above advantages of reducing the deliquescence and producing a free flowing powder, the rate of sludging of the preservative when in contact with the wood is also reduced. The compositions according to the invention are therefore preferably such as have in aqueous 4% solution a pH within the range of from 2.0-2.8, preferably 2.1-2.25.

Alkali metal dichromates which can be used in the manufacture of wood preservative compositions include the dichromates of potassium and sodium. Of these we prefer to use potassium dichromate. When sodium dichromate is used there are certain disadvantages. Thus a mixture comprising a low pH alkali arsenate free flowing powder, sodium dichromate and copper sulphate penta-hydrate can in general be stored for a reasonable length of time in a temperate climate when packed in air-tight containers. However, once the product is exposed to the atmosphere it quickly agglomerates or liquifies and becomes difficult and hazardous to handle. If, however, the anhydrous sodium dichromate is replaced by potassium dichromate the mixture can be exposed to the atmosphere for a substantially longer period without serious agglomeration and pasting.

Where copper salts are to be used copper sulphate penta-hydrate may be used providing a low pH alkali arsenate free flowing powder containing less than 70% by weight of combined arsenic, calculated as arsenic pentoxide (As_2O_5) based on an oven dry weight at 100°C ., is employed.

In order that the invention may be well understood the following examples are given by way of illustration only:

Example 1

A wood preserving composition was made up as follows:

	Percent by weight
$\text{CuSO}_4\cdot 5\text{H}_2\text{O}$	28
NaHSO_4	15
NaH_2AsO_4 (pH 4.5)	20
$\text{K}_2\text{Cr}_2\text{O}_7$	37

This composition remained as a reasonably free flowing powder when stored in air-tight containers for considerable periods and could be exposed to atmospheric moisture pick up for a reasonable period without serious caking or congealing.

Example 2

A wood preserving composition was made up as follows:

	Percent by weight
$\text{ZnSO}_4\cdot 7\text{H}_2\text{O}$	35
Low pH sodium arsenate free flowing powder (pH 2.2— $\text{As}_2\text{O}_5\cdot 2\text{H}_2\text{O}$ —67%) containing sodium bisulphate	26
$\text{K}_2\text{Cr}_2\text{O}_7$	39

Such a mixture is stable to storage for several weeks.

Example 3

A composition was made up as follows:

	Percent by weight
$\text{K}_2\text{Cr}_2\text{O}_7$	40
$\text{ZnSO}_4\cdot 7\text{H}_2\text{O}$	17.5
Low pH sodium arsenate free flowing powder (pH 2.2— $\text{As}_2\text{O}_5\cdot 2\text{H}_2\text{O}$ —67%) containing sodium bisulphate	27
$\text{CuSO}_4\cdot 5\text{H}_2\text{O}$	16.5

This mixture can be stored for prolonged periods in temperate regions without substantial caking.

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Example 4

A composition was made up as follows:

	Percent by weight
$\text{K}_2\text{Cr}_2\text{O}_7$	41
$\text{CuSO}_4\cdot 5\text{H}_2\text{O}$	32
Low pH sodium arsenate free flowing powder (pH 2.6)	21
Sodium bisulphate	6

Such a mixture is stable to storage for several weeks in a temperate climate and could be exposed to atmospheric moisture pick up for a reasonable period without serious caking or congealing.

Example 5

A composition was made up as follows:

	Percent by weight
$\text{K}_2\text{Cr}_2\text{O}_7$	41
$\text{CuSO}_4\cdot 5\text{H}_2\text{O}$	33
Low pH sodium arsenate free flowing powder (pH 2.2) containing sodium bisulphate: $\text{As}_2\text{O}_5\cdot 2\text{H}_2\text{O}$ content 70%	26

Such a mix is stable to storage for several weeks in a temperate climate and could be exposed to atmospheric moisture pick up for a reasonable period without serious caking or agglomeration.

Example 6

A composition was made up as follows:

	Percent by weight
$\text{CuSO}_4\cdot 5\text{H}_2\text{O}$	35
Low pH sodium arsenate free flowing powder (pH 2.2— $\text{As}_2\text{O}_5\cdot 2\text{H}_2\text{O}$ —67%) containing sodium bisulphate	26
Anhydrous sodium dichromate	39

Such a composition remains stable for a longer period than a similar composition containing arsenic pentoxide in place of the low pH sodium arsenate free flowing powder.

Example 7

A composition was made up as follows:

	Percent by weight
$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$	39
Low pH sodium arsenate free flowing powder (pH 2.2— $\text{As}_2\text{O}_5\cdot 2\text{H}_2\text{O}$ —67%) containing sodium bisulphate	26
$\text{ZnSO}_4\cdot 7\text{H}_2\text{O}$	35

Such a mixture is stable to storage for several weeks.

I claim:

1. A wood preservative composition in a powdered free flowing form adapted to be dissolved in water prior to use for wood preservation comprising in admixture a member of the group consisting of alkali metal and ammonium arsenates which in 1.2% w./v. aqueous solution give a pH of less than 4.6, a member of the group consisting of non-deliquescent copper and zinc salts, and a member of the group consisting of potassium dichromate, ammonium dichromate and anhydrous sodium dichromate.

2. A wood preservative composition as claimed in claim 1 which has in 4% w./v. aqueous solution a pH within the range of from 2.0-2.8.

3. A wood preservative composition as claimed in claim 2 which contains sodium bisulphate.

4. A wood preservative composition as claimed in claim 3 having in 4% w./v. aqueous solution a pH within the range of from 2.1-2.25.

5. A wood preservative composition as claimed in claim 4 which contains sodium bisulphate.

6. A wood preservative composition in a powdered free flowing form adapted to be dissolved in water prior to

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use for wood preservation comprising in admixture a member of the group consisting of alkali metal and ammonium arsenates which in 1.2 w./v. aqueous solution give a pH within the range of 2.0-3.6, a member of the group consisting of copper sulphate penta-hydrate and zinc sulphate hepta-hydrate, and a member of the group consisting of potassium dichromate, ammonium dichromate and anhydrous sodium dichromate.

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