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METHOD AND COMPOSITION FOR PREVENTING THE GROWTH OF MICRO-ORGANISMS ON SURFACES

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This invention relates to a method and a composition preventing the development of micro-organisms on container walls and other surfaces in contact with matter on which such micro-organisms and especially fungi may feed. The invention has particular reference to X-ray tanks and similar containers in which chemical or physico-chemical processes are continuously carried out and in which objects which are easily contaminated or damaged by micro-organisms, are treated by means of such processes which may be likewise affected by such organisms.

The problem of preventing micro-organisms, such as fungi, bacteria or sometimes algae, from starting to develop on wall surfaces or parts thereof is particularly pressing in connection with containers and tanks exposed to or containing fluids which favor the growth of such organisms. The problem of keeping the walls of tanks free from micro-organisms, such as algae, arises quite frequently in connection with water towers in industrial establishments, with air conditioner plants, with water reservoirs, with storage tanks for chemicals, with the tanks of toilets, etc. In tropical countries the prevention of mildew formation offers a similar problem.

The problem of suppressing the growth of micro-organisms is especially pressing in those cases in which a process has to be carried out, and in which either the objects treated or the treating agents or reagents are adversely affected by micro-organisms, so that the result of the process is affected by their presence. The containers in which the disturbing influence of the micro-organisms is most serious and marked are those exposed to chemicals which nourish such organisms, for instance X-ray tanks in which X-ray photos are treated, because the micro-organisms developing on the walls, when getting into the treatment fluids have a tendency to fog and to discolor the photographic emulsion, thus making the interpretation of the photographic picture which depends on small differences in light and shadow, difficult or impossible. As, in addition, such pictures are usually difficult to obtain or are even unique, it is of importance to suppress all influences which tend to cause a failure in obtaining a clear picture.

It will thus be understood that it is necessary or even imperative to protect such X-ray tanks against infestation with fungi. However, the protection of this particular type of container and process presents serious and special difficulties. These are due to the fact that, while many fungus or bacteria infestation preventing substances are known, the use of the majority of these substances, in connection with processes similar to those carried out in an X-ray tank, seems to be excluded. In tanks of this type the micro-organisms which feed on the chemicals, attach themselves to and collect on the walls of the containers and the protective substances therefore must not be solely of a type not affecting the

films or other objects treated or the treatment carried out within the tank, but they must also remain permanently active on the wall of the container for a protracted period of time, whether the tank is in use or not, notwithstanding the constant passage of liquid, of chemicals and of large quantities of water through the tanks during use. As most of the known fungicidal and bactericidal substances are only active in solution, they are thus ineffective for the treatment of a surface of a container wall which is constantly in contact or flushed with quantities of water and chemicals or is even submerged below the same.

The invention relates to a method of treating the walls of containers or tanks of the type specified, which are in constant contact with chemicals and with large quantities of water, with a fungicidal composition which is not carried away by the liquid passing through the tank and which adheres more or less indefinitely to the tank walls notwithstanding the passage of fluids over them, thus preventing the infestation of the walls with the micro-organisms.

According to the invention a polychlorophenol was selected as the fungicide which is however used in a form in which it is insoluble or difficultly soluble in water and which is mixed with a solution which consists of a readily vaporizable solvent and a carrier for the fungicide which is also insoluble in water and in any one of the chemicals used in the tank. This carrier must be of a viscous consistency or in a colloidal state, so that it can be readily and completely mixed with the fungicidal substance when in solution, and when applied to the surface to be protected, will firmly adhere thereto, holding the fungicide in an active condition for a protracted period of time.

It may be noted that fungicides or bactericides using a polychlorophenol and especially trichlorophenol are known by themselves; and they have however always been used after bringing them into such a state that they are water soluble, by introducing them into a solution carrying them, the solution being essentially the carrier of the protection against micro-organisms. This method is however inapplicable in connection with X-ray tanks which could not be protected effectively by merely protecting the solutions passing through the tank.

To obtain the protection of the tank walls rather than that of the solution held within the tank or passing through the same, according to the invention first a solution is prepared using a vaporizable solvent which is preferably a hydrocarbon, such as benzene and in which a viscous adhesive carrier substance, which is insoluble in the fluids passing through the tanks, for instance paraffin, is dissolved. Preferably a saturated solution is formed.

A polychlorophenol, such as trichlorophenol, is added to this solution to the extent of saturation, so that no further dissolution of the trichlorophenol introduced takes place. The resultant compound is a viscid liquid which is ready to be applied on the container wall to be protected, either by using a brush or a swab or by means of an aerosol container which atomizes and sprays the viscid liquid. The liquid thus applied adheres to the walls and the solvent, when exposed to the air immediately and rapidly evaporates, leaving an adhering coating containing now solely the carrier and the intimately admixed fungicide on the surface to be protected which very effectively inhibits the growth of fungi.

The polychlorophenol is preferably either pentachloro-

phenol or a trichlorophenol of which several types are known, distinguished by the position of the chlorine atom, but all above mentioned polychlorophenols function in the same way as fungicides and bactericides in connection with this invention. The difference in solubility between the best known polychlorophenols is only slight, if care is taken not to bring them into contact with substances with which they will react and produce a soluble compound. The solubility of the three best known trichlorophenols is 0.2% (for the 2,4,5 trichlorophenol), 0.08% (for the 2,4,6 trichlorophenol) and 0.0925% (for the tetra and other trichlorophenols known).

The paraffin is essentially a carrier for the fungicide; it may be replaced by other carries substances such as beeswax, spermaceti, montan wax. Likewise, the benzene may be replaced by other solvents which dissolve both paraffin and trichlorophenol, such as carbon tetrachloride, ether, toluene, chloroform, turpentine.

The above described method of dissolving the polychlorophenol (in a nearly water insoluble form) and an adhesive viscous carrier substance in an evaporizable solvent for both mentioned substances, is applicable to all types of surfaces in connection with which a similar problem arises, namely to suppress the growth of micro-organisms of walls which are constantly or frequently in contact with chemicals and/or water.

The application of the method to photographic X-ray tanks which are susceptible to being infested by micro-organisms, has marked advantages. For instance, the water consumption can be greatly reduced, as it becomes unnecessary to have a constantly running water stream flowing through the tank to prevent the contamination of the film by fungi. Further, such tanks, in order to keep them sufficiently free of micro-organisms, have to be scrubbed very frequently, an operation which can now be completely eliminated.

The small quantity of the polychlorophenol which goes into solution does not materially count, although the coating of the walls with paraffin has to be renewed from time to time at intervals. The coating, however, has mainly to be renewed, because it is worn away mechanically before the small solubility of the trichlorophenol exhausts the supply of the latter in the coating.

Example

To protect X-ray tanks in which development, fixing and/or watering occurs the solution is prepared in the following manner:

For 100 cc. of benzene 4.5 grams of paraffin and 4.0 grams of 2,4,5 trichlorophenol are taken. First a saturated solution of the paraffin in benzene is produced by dissolving the former in the latter. The trichlorophenol is then added to the solution until no further dissolving takes place. This, with the above stated weight, would occur approximately when all trichlorophenol has been used. The solution is then saturated with both components.

The dissolving is carried out at room temperature. If other temperatures prevail the amounts above stated will vary. The essential point however is that the solution is always saturated with respect to paraffin, as well as with respect to the trichlorophenol.

The resultant liquid is a viscid straw colored liquid. This liquid is applied by means of a brush or a swab to the wall of the container. Instead of applying it in this way also spraying by means of an aerosol container can be practiced. When the walls of the tank to be protected have been covered completely so that the liquid is exposed to the air the solvent evaporates rapidly, leaving a paraffin film covering the walls of the container. This film of paraffin intimately mixed with the fungicide now protects the tank walls effectively against infestation with fungi or other micro-organisms, while

the normal operation of developing, fixing, watering may go on in the tank for a time which is indefinite. When the coating of the film of the wall is worn away the operation of covering the wall with the above solution is repeated.

As a further example paraffin may be substituted by the same volume of beeswax, spermaceti or montan wax.

While it will be clear that the problem to protect the container walls of X-ray tanks in which constantly certain processes are carried out is difficult to solve, and is a special problem the method is likewise applicable and functions equally well in connection with other containers in which the walls are essentially the places on which the micro-organisms tend to fix themselves to grow and to accumulate, such accumulation being especially objectionable where objects are handled or processes are carried out which may be contaminated by the fungi.

The method of protecting has been applied with good results to shower curtains to be protected from mildew in tropical climates, to shower floors to prevent infestation with the fungus producing ringworm (athlete's foot) and to swimming pools in order to protect against the growth of algae.

Further the method will be of use in connection with industrial and agricultural storage tanks, in connection with the containers of chemicals promoting growth of micro-organisms and in connection with the water towers and tanks of air conditioning and other industrial installations. It is to be considered as an effective method for protection of leather against mildew, and of tanks of toilets against the growth of algae therein.

In connection with X-ray tanks it has been established by tests that neither the chemical reaction of the developer nor that of the fixing solution is in any way disturbed by the application of the protective coating. It has also been found by tests that no influence on the characteristics of the film or on the developing or fixation times of the film can be detected.

The protection of the walls does away with the necessity of keeping the water running constantly through the tank, except when washing the film. Thus, the water consumption and the attention to be paid to the equipment is materially reduced.

The coating of the walls with the fungicide which produces an effective prevention also eliminates the necessity of removing fungus growth after it has developed, such removal being a difficult and troublesome operation.

The invention thus provides simple and effective means for protecting the tank wall surfaces against micro-organisms, said means acting as a preventive, keeping the micro-organisms from growing on the surfaces to be protected, without in any way interfering with the processes going on within the tank. Thus, the X-ray film is indirectly very effectively protected against the contamination which is due to such micro-organisms.

It will be clear that minor changes may be made in the method and the composition without in any way departing from the invention as defined by the annexed claims.

What is claimed as new is as follows:

1. A method of protecting the walls of X-ray photo development tanks against the development of micro-organisms on the tank walls which consists in coating the surface of the tank walls with a substantially saturated solution of 2,4,5 trichlorophenol in a solution of paraffin in benzene, the evaporation of the benzene producing a viscous coating consisting of an intimate mixture of the trichlorophenol with the paraffin, the micro-organisms repelling and destroying and water-insoluble trichlorophenol being thus held on the wall of the tank during a succession of film development, fixing and watering operations carried out within the tank during a

protracted period of time, the relative proportions of said coating solution being, for each 100 cc. of benzene, about 4.5 grams of paraffin and about 50 grams of 2,4,5 trichlorophenol.

2. A composition preventing the micro-organism infestation of the walls of X-ray photo development tanks exposed to fluids, comprising a saturated solution of 2,4,5 trichlorophenol in a solution of paraffin in benzene, in the proportions of 100 cc. benzene of 4.5 grams of paraffin and 40 grams of 2,4,5 trichlorophenol.

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