ADVACIDE 340-A (EPA #8314-20)

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Although the E.P.A. has not made any formal, public announcement of its decision on the use of phenyl mercurial microbiostats in coating systems, it appears a certainty based on recent decisions made by this agency in other areas, that mercury will be restricted for use in paint. Pressures exerted by groups which are either politically or environmentally motivated make it almost impossible for E.P.A. to arrive at any other verdict than to ban mercury completely.

Recent lead legislation authored by F.D.A. includes a maximum restriction on other toxic heavy metals and according to this F.D.A. Proposal, 21 CFR Part 191, it is clearly stated "That the following articles are hazardous within the meaning of the Act because they are capable of causing substantial personal injury or illness during or as a proximate result of any customary or reasonably forseeable handling or use:

2 "Paint and other surface coating materials produced or shipped in interstate commerce, containing any of the heavy metals specified below at a level exceeding that which is essential, etc.

(ii) "Antimony, arsenic, cadmium, mercury and selenium of which the metal content individually or in total (calculated as the metal) exceeds 0.05% of total weight of the contained solids or drier paint film."

I think we have to be realistic and assume mercury will be legislated out of trade sales paints, it already has been prohibited in antifouling ship bottom paints, and proceed to assist the coatings industry by providing a viable substitute. In this area, however, coatings formulators have a wide selection of substitutes.

It is difficult to keep score, but as far as I can determine there are at least 38 products of assorted varieties and functions being offered by as many as 21 different producers. Some of these are chemical equivalents and while there are 38 identifiable trade names there are not necessarily that many different chemical compounds.

With such a variety of microbiostats, it is little wonder that there is confusion in the industry, with everyone being faced with the prospect of making a decision to select the right replacement for mercury the first time.

Although there is no microbiostat with the same successful history of use as PMA, and certainly none that consistently rivals the cost/performance attributes of mercurials, we would not be far wrong in claiming second place for tributyltin compounds of which Advacide 340-A is a member.

As far as we are concerned, 340-A is a viable replacement for mercury with many similarities. One is its ability to perform as both a bacteriostat and fungistat, controlling a very broad spectrum of microorganisms.

Since 340-A is water dispersible and at the same time soluble in common paint solvents, oils and alkyd resins, it can be used in both aqueous and non-aqueous coatings.

It has an acute oral LD_{50} of 633 mg./kg. body weight of rats and an acute dermal LD_{50} in the range 930-2000 mg./kg. body weight of albino rabbits.

According to the provisions of 21 CFR 121.2520 as set forth by F.D.A. Advacide 340-A may be safely used in adhesives as a preservative for articles intended for use in packaging, transporting or holding of food where the adhesive is separated from the food by a functional barrier.

Tributyltin oxide, per se, has a long history of use dating back to the 1950's and is well documented by various publications among which is a survey entitled "Technological and Commercial Survey of the Biocidal Applications of Organotin Compounds" prepared by International Technical Surveys Inc., Geneva, Switzerland.

Another report from Organotin Research Association of Japan entitled "Fungicidal and Wood Preservation Properties of Organotin Compounds" provides supporting data for TBTO. There is a lengthy report on "Biologically Active Organotin Compounds" in The Journal of Oil, Color and Chemists Association which describes the efficacy of TBTO in paint manufacturing.

A recent article in a magazine "Tin and its Uses" describes the "Effects of an Organotin on Microbial Activities in Soil." The conclusion was that tributyltin oxide at levels up to 100 ppm in soil will have no biologically significant impact on soil microorganisms and their functions in maintaining soil fertility. From an ecological standpoint this is important.

Another important contribution to organotin technology is represented by an article in PVP, December 1972, written by R.J. Vizgirda, M&T Chemicds. Several important observations were made:

1) Organotins do not present an immediate or long term hazard. Unlike mercury, arsenic and lead, organotins degrade in the animal organism to lower less toxic forms and eventually break down to non-toxic inorganic tin.

2) Tin, although found in animal organisms, is not cumulative and is rapidly and essentially excreted.

3) There is no evidence to indicate that Tin, like mercury, is converted to alkyltin under environmental conditions or in the animal organism.

4) Long-term studies with animals clearly indicate a reversal of any adverse symptoms or withdrawal of the organotin feed.

5) In environmental conditions, such as oxygen, ozone and sunlight, organotins degrade to less toxic forms of the organotin and then to inorganic tin.

CMC has contributed much to the advancement of organotin compounds as microbiostats in many applications. We supply TBTO in one form or another for use in tile grout, vinyl wall covering, library pastes and glues, wall paste adhesives, wire insulation compounds, textiles, wood-treating preservatives, tape joint cements, PVC foam backing for outdoor carpeting, Wax treated twines, acrylic and butyl sealants, oil-based stains, latex glazing compounds, universal colorants and water-treating compounds.

Unfortunately, there is no magic formula for calculating the amount of 340-A that will effectively replace X pounds of mercury. We can only offer suggestions as starting points based on past experience.

Generally, for protection against bacteria (can preservation) in a latex paint, Advacide 340-A in the range of 0.3% to 1.0% would be a safe recommendation. For protection against fungi, 1% to 3.0% may be required. In both cases there is evidence to show that lower levels are adequate.

Much depends upon the susceptibility of the coating to microbial attack and the amount of nutrient available to support growth. In addition to all this we must consider the environmental conditions to which the film will be subjected after application.

There are several important points to take into account when considering the advantages of Advacide 340-A.

1) It will not adversely affect storage stability of the paint.

2) It will not produce any adverse effect on the decorative or protective function of the applied film.

3) It will not cause staining or discoloration in a film that is applied in areas of high sulfur content atmosphere, provided other sulfur sensitive additives are excluded from the formulation.

4) There is no danger of galvanic action between 340-A and other metals when in direct contact.

5) It is substantive to cellulose which means it becomes firmly fixed and does not bloom from wood substrates.