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CALIFORNIA METAL ENAMELING COMPANY
6904 EAST SLAUSON AVENUE · LOS ANGELES 22, CALIFORNIA · RAYMOND 3-6351

January 25, 1963

Dr. Robert A. Kehoe
University of Cincinnati
The Kettering Laboratory
College of Medicine - Eden Avenue
Cincinnati 19, Ohio

Dear Dr. Kehoe:

We wish to thank you for your letter of January 23, 1963, regarding the ceramic glazes to be used in aluminum cookware. Your thoughts on the matter are very much appreciated, as well as your carefully explained reasons for your answers to our questions.

We are enclosing a copy of the California Test Method, which will explain their system for testing. We have checked the various colors proposed to be used in this program and find them to have a lead solubility of between two (2) and four (4) parts per million when tested with boiling acetic acid.

Basically, the reason for the finish on the interior of the aluminum bowls is one of esthetics and saleability of the product. It is not in there for any engineering purpose per se.

There are other porcelain finishes for aluminum which are lead free. It is our understanding, however, that the frits are generally composed of other types of heavy metals such as cadmium, and that these other metals might generally be as toxic as the lead used in the formulation proposed for the units in question. We have generally found that their resistance to acetic acid and citric acid are not as high as the lead bearing glazes proposed. We received a report from a Dr. Rutherford P. Johnstone, written by Mr. Edgar Littlefield. In this report, Mr. Littlefield suggested a test of 48 hours of lemon juice and vinegar. In running this test the parts were carefully scrutinized to check the surface for any roughening or pitting, or any other change in texture or color. No such change was noted on a close examination of the parts. Mr. Littlefield stated that "If these full strength food acids do not affect the glaze, you can, in my opinion, consider the glaze to be safe.".

Actually, these parts, being proposed, would not be used as a daily thing. This is a gift ware item, which would be used more for entertaining, generally speaking.

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We recognize the need for control of lead in products such as these, and do not wish to produce any article which would tend to be unsafe in use. These particular products, however, cannot achieve acceptance without the porcelain finish applied to the interior and if our glaze does not constitute a hazard, we would then propose to manufacture these parts under careful production controls. We would most certainly appreciate your comments relative to the above additional information.

Very truly yours,

H. V. Penton
President

HVP:hb

Enc.

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SAFETY DEPARTMENT

TENTATIVE METHOD OF TEST FOR SOLUBILITY OF LEAD FROM GLAZE SURFACES

Scope:

This method of test covers the procedure for determining the lead extraction from glaze surfaces on exposure to organic acids, more specifically acetic acid.

Significance of Test:

This is a simple procedure for plant control use. The test may give too high values for "lead" because other metals, such as copper, bismuth, cadmium, tin, arsenic, antimony, or mercury which may also be present, are precipitated.

The "dithizone method" [1] may be used as a more specific test for lead. The present test though, designed to simulate conditions in service, should be of use for plant control and development work.

Test Specimens:

Various glazed shapes may be used, e.g., fruit dishes, bowls, cups, etc. For more critical comparison a similar shape should be used so that the total surface contacted by the reagent during the test is nearly the same. A standard size cup is recommended.

Standard Solutions:

The standard solutions should be prepared by adding the correct amounts of chemically pure lead nitrate to a 4% acetic acid solution[2].

In many instances, it will be found to be more convenient to use white distilled vinegar which contains about 5% acetic acid. Where this is done the white distilled vinegar shall be used also in preparing the standard solutions.

Standards shall be prepared which contain 1/2, 1, 2, 4, and 8 parts of lead per million parts of reagent. To prepare the standards, dissolve 0.0125 grams of C. P. $Pb(NO_3)_2$ in 500 cc of reagent and dilute to exactly 1 liter. This solution will contain 8 ppm of Pb. 500 cc of this shall be saved as a standard solution of this concentration. The remaining 500 cc solution shall be diluted to 1 liter which produces a concentration of 4 ppm of lead. The dilution process shall be continued in preparing the standard solutions containing 2, 1, and 1/2 ppm Pb in solution.

(over)

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The standard solutions shall be subjected to the H_2S precipitation as described under procedure. The color of the precipitated standards fade in light so it is necessary to prepare freshly precipitated standards daily before each series of tests. The stability of these samples can be improved by the addition of 1/4% gelatin to the standard solutions.

If the reagent after the test contains higher amounts of lead, aliquot portions shall be used in the colorimetric comparisons. Higher concentrations of lead make comparison difficult or impossible.

Procedure:

A. 150 cc of the boiling reagent (5% acetic acid solution or white, distilled vinegar) shall be poured into the standard cup or other shape specimen and allowed to cool for 1/2 hours. The reagent shall then be placed in a Nessler tube. A brisk evolution of hydrogen sulfide gas shall be passed through the reagent for 3 minutes. The coloration of the reagent shall then be compared with the standard solution in Nessler tubes which have been subjected to the same hydrogen sulfide treatment. A suitable colorimetric or turbidimeter will greatly aid in making comparisons.

   The colorimetric comparisons shall be made as soon as possible after the precipitation of the test reagent and standard solutions.

B. An alternate procedure involves the exposure of the test specimen to the test reagent introduced and maintained at room temperature for a period of 24 hours.

Reports:

The report shall state the lead in ppm contained in the test reagent. It shall further indicate the specific reagent[2] used, the specimen shape, and which of the test conditions (A) or (B) was employed.

1/ Scott's Standard Methods of Chemical Analysis, N. H. Furman, Editor 5th Edition, Vol. I. p 521, D. Van Nostrand Co., Inc. 1939

2/ 5% acetic acid solution or white, distilled vinegar. It may also be desirable in some cases to use other organic acids, e.g., citric acid. The concentration of the organic acid used shall be stated.