MIL-S-50005A(MU)
31 January 1969
SUPERSEDING
MIL-S-50005(ORD)
21 November 1958

MILITARY SPECIFICATION

STANNIC OXIDE, TECHNICAL

1. SCOPE

1.1 Scope. This specification covers stannic oxide (tin dioxide) for use in the manufacture of propellants.

1.2 Classification. Stannic oxide shall be of the following classes, as specified. (See 6.1).

Class 1 (see table I)
Class 2 (see table I)

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

RR-S-366 - Sieve, Test
PPP-D-723 - Drums, Fiber

STANDARD

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

FSC 6810

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM D1193-66 - Specification for Reagent Water

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103).

3. REQUIREMENTS

3.1 Material. Stannic oxide shall be a fine white crystalline powder of purity and granulation specified herein.

3.2 Volatile content. The volatile content of stannic oxide shall not be more than 0.50 percent when tested as specified in 4.4.2.

3.3 Assay. Stannic oxide on a dry basis shall be minimum 98.2 percent pure when tested as specified in 4.4.3.

3.4 Granulation. When tested as specified in 4.4.4, the stannic oxide shall conform to the granulation requirements specified in table I.

Table I. Granulation requirements

Sieve number	Class 1	Class 2
Thru No. 200 sieve percent by weight, min.	95	95
Thru No. 325 sieve percent by weight, min.	85	90

3.5 Acidity. When tested as indicated in 4.4.5, the limit of acidity shall be not more than .01 percent calculated as sulfuric acid.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Size of lot.

4.2.1 At place of manufacture. For the purpose of sampling, a lot of stannic oxide shall consist of manufacturer's batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process and subjected to some physical mixing operation intended to make the final product substantially uniform. If the material cannot be identified by batch, a lot shall consist of not more than 50,000 pounds of stannic oxide offered for delivery at one time.

4.2.2 At place of delivery. For the purpose of sampling, a lot of stannic oxide shall consist of all the stannic oxide in a single shipment.

4.3 Sampling. A composite sample of not less than a 1/4 pound representative specimen shall be removed from each of five containers taken at random from each lot. The specimen shall be placed in a clean, dry container, thoroughly blended, and labeled to identify the container and lot represented.

4.4 Test methods.

4.4.1 General. Distilled water, in accordance with ASTM D1193, and analytical grade reagents shall be used throughout the tests. Blank determinations shall be run in parallel with the tests, using the same quantities of reagents used in the tests, and corrections shall be applied when necessary.

4.4.2 Volatile content. A sample of 10 grams shall be heated at 110° ± 5°C for 3 hours. Calculate as follows:

$$\text{Percent of volatile} = \frac{\text{Loss of wt.}}{\text{Wt. of sample}} \times 100$$

Retain the dried specimen for procedures in 4.4.3.

4.4.3 Assay. Transfer 2.0000 grams of the dried sample to a nickel crucible of 45 to 50 ml. capacity. Add 3 grams of sodium carbonate and mix with a platinum wire. Add 10 grams of sodium peroxide and again mix with a platinum wire. Heat gently over a Meker burner until the mixture melts, then gradually raise the temperature to the full heat of the burner. Swirl frequently. Cool and dissolve the melt in 100 ml. of water contained in a 400 ml. beaker. Remove the crucible with a stirring rod and rinse with hot 5 percent hydrochloric acid. Add 100 ml. of concentrated hydrochloric acid slowly with constant stirring. Transfer to a 500 ml. Erlenmeyer flask and add 10 to 15 grams of strip nickel. Close the flask with a tin head (a rubber stopper containing a bent glass tube extending on the outside to the bottom of the flask). Boil gently for 70 minutes. Add another 10 grams of nickel and boil gently for another 70 minutes. Insert the end of the glass tube into a 250 ml. beaker containing 200 ml. of sodium bicarbonate solution (10 percent). Remove the flask from the hot plate and cool to about 10°C.

Weigh 0.9000 gram of potassium iodate into a 100 ml. beaker and add 0.3 gram of sodium bicarbonate and 50 ml. of boiled water at 60° to 70°C. Break up the crystals with a stirring rod and stir until completely dissolved. Cool in an ice bath. Remove the stopper from the flask containing the sample and immediately add the potassium iodate-sodium bicarbonate solution while swirling constantly to prevent free iodine from coming in contact with the nickel. Add a few marble chips, 5 ml. of starch solution (1 percent), and titrate immediately to a blue end point with a solution of potassium iodate containing 3.0000 grams of potassium iodate per liter.

Run a standard as follows: Transfer 1.5735 grams of pure tin (equivalent to 2.0000 grams of stannic oxide) to a 500 ml. Erlenmeyer flask. Add 50 ml.. of concentrated hydrochloric acid and let stand at room temperature to dissolve. Fuse a mixture of 3 grams of sodium carbonate and 10 grams of sodium peroxide in a nickel crucible. Cool, and dissolve the melt in 150 ml. of water and 50 ml. of concentrated hydrochloric acid. Add the resultant solution to Erlenmeyer flask containing the tin and carry the sample through the procedure. Calculate percent stannic oxide as follows:

$$\text{Percent of stannic oxide} = \frac{\text{Grams of } KIO_3 \text{ required for titration of 2 grams of the sample}}{\text{Grams of } KIO_3 \text{ required for the titration of pure } SnO_2} \times 100$$

or

$$\text{Percent of stannic oxide} = \frac{0.9000 + \frac{3V_1}{1000}}{0.9000 + \frac{3V_2}{1000}} \times 100$$

where: V_1 = volume of potassium iodate solution (3 grams per liter) used in titration of the sample.
V_2 = volume of potassium iodate solution (3 grams per liter) used in titration of the standard

4.4.4 Granulation. Weigh 10 grams of the sample into a 250 ml. beaker and add 15 ml. of 95 percent ethyl alcohol while stirring. Add 100 ml. of water and wash into a No. 200 sieve. Wash through the sieve with a slow stream of water while brushing gently with a camel-hair brush. Dry the sieve at 105°C for 1 hour, and carefully brush the particles into a tared watch glass. Weigh, and subtract to obtain the weight of the residue. Repeat the procedure using a No. 325 sieve.

$$\text{Percent of stannic oxide passing through sieve} = \frac{(W-P) \times 100}{W}$$

where: W = weight of sample.
P = weight of residue retained by sieve

4.4.5 Acidity. Transfer a 10 gram portion of the sample to a 250 ml. beaker, add 100 ml. of neutral distilled water and boil for 2 minutes. Cool, filter and titrate with 0.01 N sodium hydroxide solution using methyl red indicator.

$$\text{Percent sulfuric acid} = \frac{4.9\ NV}{W}$$

where: N = normality of sodium hydroxide solution
V = volume of sodium hydroxide solution
W = weight of sample

4.4.6 Packing and marking. It shall be ascertained that the packing and marking conform to the requirements of section 5 of this specification.

4.4.7 Rejection. The lot shall be rejected if the sample fails to comply with any of the requirements specified, whether tested by the contractor or check tested by the Government.

5. PREPARATION FOR DELIVERY

5.1 Packaging and packing.

5.1.1 Level C. Unless otherwise specified, the stannic oxide shall be packed in 400 pound fiber drums conforming to PPP-D-723.

5.2 Marking. In addition to any special marking required by the contract or order, marking for identification and shipment shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Stannic oxide is intended for use as an anti-fouling agent.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number and date of this specification.
(b) Class required (see 1.2).
(c) Packaging and packing (see 5.1).

Custodian:
Army - MU

Preparing activity:
Army - MU

Review activities:
Army - MU, MD

Project No. 6810-A848

User activities:
Army - MI

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

[ ] DIRECT GOVERNMENT CONTRACT [ ] SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

[ ] YES [ ] NO *(If "yes", in what way?)*

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity - Optional)*

DATE

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REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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