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Provisional Specification For  
Titanium Powder use in Pyrotechnic  
Store.

Specification No. HEMRL/PYRO/PS/305-11

Ti/PS

PROVISIONAL SPECIFICATION FOR TITANIUM POWDER  
FOR USE IN PYROTECHNIC STORES.

SPECIFICATION NO. HEMRL/PYRO/PS/305-1998

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1. SCOPE :

This specification prescribes the requirements and test methods for titanium powder for use in pyrotechnic stores.

2. REQUIREMENTS:

Description :-- The material shall be in the form of grey crystalline fine powder, free from grit, impurities and foreign matter.

Particle size : The material shall have a particle size less than 6 microns or an agreed to between the purchaser and the supplier.

The material shall also comply with the requirements specified in Table-1, when tested according to the methods given in the Appendixes.

TABLE-1

Sr No.	Characteristic	Requirement	Method
i)	Volatile Matter at 105 ± 2°C for 2 hrs, max.	0.3%	Appendix-A
ii)	Matter insoluble in concentrated HCl, max.	1.5 %	Appendix-B
iii)	Purity, min.	97.0 %	Appendix-C
iv)	Sieving requirements :		
	a) Passing 53 micron IS sieve.	100%	
	b) Average particle size	4-5 microns or as agreed.	
v)	Apparent density (g/ml)	1.5±0.2	

3. PACKING:

The material shall be supplied in sound, clean and dry packages containing an approved quantity. The inclusion of any foreign matter or impurities in any of the packages will render the whole consignment liable for rejection.

4. MARKING:

Each package or consignment in which the titanium metal powder is supplied, shall be clearly and legibly marked with a description of the contents, a distinctive lot number, the tare and nett weight, the date of manufacture and the contractor's initials or recognised trade mark.

APPENDIX-A

DETERMINATION OF VOLATILE MATTER

PROCEDURE

Transfer about 5 g of sample to a clean, dry and tared moisture dish, with cover (M1) and weigh accurately (M2). Uncover the dish and heat the sample for 2 hours in electric oven at  $105 \pm 2^\circ\text{C}$ . at the end of this period, cover the moisture dish cool in a desiccator to room temperature and weigh (M3). Calculate the volatile matter from the loss in weight.

$$\text{Volatile matter \% by mass} = \frac{M_2 - M_3}{M_2 - M_1} \times 100$$





where

- M1 = Mass in g of the empty dish & the cover.  
M2 = Mass in g of the dish & the cover with the sample taken.  
M3 = Mass in g of the dish and cover with sample taken after heating.

#### APPENDIX-B

##### ACID INSOLUBLE MATTER CONTENT

Weigh about 0.1 g of titanium metal powder accurately and transfer to a 250 ml glass beaker. Dissolve it in 25 ml of conc. hydrochloric acid by heating on a sand bath in a fume chamber. Cool and filter through sintered tared G-4 crucible (1) and wash the insoluble matter by distilled water (about 50 ml each time) two times. Keep the filtrate aside (for titanium contents). Dry the crucible alongwith residue at  $100 \pm 5^\circ\text{C}$  in an electric oven for two hours. Cool the crucible and weigh (M2).

$$\text{Acid Insoluble matter} = \frac{(M_2 - M_1) \times 100}{\text{Mass of the sample}}$$

#### APPENDIX-C

##### METALLIC TITANIUM CONTENT

Dilute the filtrate and the washings, (from Appendix-B) to about 100 ml with distilled water, add 100 ml of a freshly prepared 10% aqueous diammonium hydrogen phosphate (AR) solution (use 10 ml for every 10 mg of titanium sample taken). Boil the solution for a few minutes and allow to digest for overnight.  
*add 25 ml of Ammonical soln. sp D*

Filter the precipitate through Whatman no.42 filter paper, wash the residue with distilled water and dry the residue at  $100 \pm 5^\circ\text{C}$  for one hour. Ignite the filter paper alongwith the precipitate in a tared silica crucible (M1). Heat the silica crucible in an electric muffle at about  $800^\circ\text{C}$  till constant weight (about 3 hrs). Weigh as titanium pyrophosphate,  $(\text{TiP}_2\text{O}_7)$  (M2) and calculate titanium content-

$$\% \text{ of Titanium content} = \frac{\text{Mass of Titanium pyrophosphate} \times 100 \times 0.216}{\text{Mass of the sample}}$$

M2 - M1 is the mass of titanium pyrophosphate.

#### APPENDIX-D

#### DETERMINATION OF APPARENT DENSITY

20 g of the material is introduced into a stoppered glass cylinder, graduated in 0.5 ml, the cylinder being approximately of 15 cm height and having an internal dia of 2 cm. A cylinder is dropped vertically 30 times from a height of 6.5 cm on to the hard leather pad. The surface of the column of titanium powder is levelled off by the minimum amount of side tapping, and the total volume is read off.

$$\text{Apperent density in g/ml} = \frac{\text{Mass of the sample}}{\text{Volume of the sample}}$$

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