



PARTICULATES NOT OTHERWISE REGULATED, TOTAL

0501

DEFINITION: total aerosol mass

CAS: NONE

RTECS: NONE

METHOD: 0501, Issue 1

EVALUATION: FULL

Issue 1: 8 May 2015

OSHA: 15 mg/m³, total dust (inert or nuisance dust; particles not otherwise regulated) [1] **PROPERTIES:** Contains no asbestos and less than 1% quartz

NIOSH: no REL

For other OELs and guidelines: See references [2,3]

SYNONYMS: Nuisance dusts; particles not otherwise specified (PNOS)

SAMPLING	MEASUREMENT
<p>SAMPLER: INTERNAL CAPSULE (tared 37-mm, 2- to 5-μm PVC filter melded to PVC housing) in 37-mm 2-piece cassette</p> <p>FLOW RATE: 1 to 2 L/min</p> <p>VOL-MIN: 17 L @ 15 mg/m³- -MAX: 333 L @ 15 mg/m³</p> <p>SHIPMENT: Routine</p> <p>SAMPLE STABILITY: 28 days minimum</p> <p>BLANKS: Minimum of 2 field blanks per batch</p>	<p>TECHNIQUE: GRAVIMETRIC (INTERNAL CAPSULE WEIGHT)</p> <p>ANALYTE: Airborne particulate material</p> <p>BALANCE: 0.001 mg sensitivity; use same balance before and after sample collection</p> <p>CALIBRATION: National Institute of Standards & Technology Class S-1.1 weights or ASTM Class 1 weights</p> <p>RANGE: 0.25 to 5 mg per sample</p> <p>ESTIMATED LOD: 0.075 mg per sample</p>
ACCURACY	<p>PRECISION (\bar{S}_r): 0.031 @ \approx2 mg per sample [4]</p>
<p>RANGE STUDIED: 0.1 to 4 mg per sample</p> <p>BIAS: 0.058 [4]</p> <p>OVERALL PRECISION (\hat{S}_{rr}): 0.059 [4]</p> <p>ACCURACY: \pm 15.5%</p>	

APPLICABILITY: The working range is 2.5 to 50 mg/m³ for a 100-L air sample. This method is nonspecific and determines the 'total' dust concentration to which a worker is exposed.

INTERFERENCES: Moisture and static electricity can affect gravimetric measurements. Humidity control and minimization of static effects are addressed in this procedure.

OTHER METHODS: The method is similar to Method 5100 for carbon black [5]. This method is preferred over 0500, Issue 2 [6]. OSHA method PV2121 describes a similar procedure (but for respirable sampling) using an alternative sampler design [7].

EQUIPMENT:

1. Sampler: Internal capsule, 37-mm polyvinyl chloride (PVC), 2- to 5- μ m pore size membrane or equivalent hydrophobic filter attached to PVC housing and supporting pad in 37-mm 2-piece cassette filter holder

NOTE: The cassettes should be fabricated so as to ensure complete sealing of the internal capsule after sample collection.

2. Personal sampling pump, 1 to 2 L/min, with flexible connecting tubing
3. Microbalance, capable of weighing to ± 0.001 mg
4. Static neutralizer, e.g., ^{210}Po ; replace no more than nine months after the production date
5. Tool for handling internal capsules, e.g., forceps (preferably plastic)
6. Environmental chamber or room for balance (e.g., $20\text{ }^\circ\text{C} \pm 1\text{ }^\circ\text{C}$ and $50\% \pm 5\% \text{ RH}$)

SPECIAL PRECAUTIONS: None.

PREPARATION OF INTERNAL CAPSULES BEFORE SAMPLING:

1. Equilibrate the PVC filter capsules in an environmentally controlled weighing area or chamber for at least 24 hours.
NOTE: An environmentally controlled chamber is desirable, but not required.
2. Place backup pads in filter cassette bottom sections.
3. Weigh the filter capsules in an environmentally controlled area or chamber. Record the internal capsule tare weight, W_1 (mg).
 - a. Zero the balance before each weighing.
 - b. Handle the filter capsule with forceps. Pass the internal capsule over an antistatic radiation source. Repeat this step if the capsule does not release easily from the forceps or if it attracts the balance pan. Static electricity can cause erroneous weight readings.
4. Assemble the filter capsules in the filter cassettes and close firmly so that leakage around the internal capsule will not occur. Place a plug in each opening of the filter cassette. Place a cellulose shrink band around the filter cassette, allow to dry and label the cassette with indelible ink.

SAMPLING:

5. Calibrate each personal sampling pump with a representative sampler in line.
6. Sample at 1 to 2 L/min for a total sample volume of 17 to 333 L. Do not exceed a total filter capsule loading of approximately 5 mg total dust. Take two to four replicate samples for each batch of field samples for quality assurance on the sampling procedure.

SAMPLE PREPARATION:

7. Wipe dust from the external surface of the filter cassette with a moist paper towelette to minimize contamination. Discard the paper towelette.
8. Remove the top and bottom plugs from the filter cassette. Equilibrate for at least 24 hours in the balance room.
9. Using forceps, open the cassette and remove the internal capsule gently to avoid loss of dust or damage to the capsule.

CALIBRATION AND QUALITY CONTROL:

10. Zero the microbalance before all weighings. Use the same microbalance for weighing filter capsules before and after sample collection. Calibrate the balance with National Institute of Standards and Technology Class S-1.1 or ASTM Class 1 weights.
11. Process laboratory blanks, spiked QC samples and field blanks at a minimum frequency of 1 per 20 field samples. Internal capsules used for QC samples should come from the same lot. Spiked QC samples, loaded with 0.25-4 mg of material per internal capsule, should be prepared using weight-stable material such as Arizona Road Dust [8].

MEASUREMENT:

12. Weigh each capsule, including field blanks. Record the post-sampling weight, W_2 (mg). Record anything remarkable about a capsule (e.g., overload, leakage, wet, torn, etc.).

CALCULATIONS:

13. Calculate the concentration of total particulate matter, C (mg/m³), in the air volume sampled, V (L):

$$C = \frac{(W_2 - W_1) - (B_2 - B_1)}{V} 10^3, \text{ mg/m}^3$$

where: W_1 = tare weight of capsule before sampling (mg)
 W_2 = post-sampling weight of sample-containing capsule (mg)
 B_1 = mean tare weight of blank capsules (mg)
 B_2 = mean post-sampling weight of blank capsules (mg)

EVALUATION OF METHOD:

Lab testing was carried out using blank internal capsules and with capsules spiked with 0.1 – 4 mg of NIST SRM 1648 (Urban Particulate Matter) and Arizona Road Dust (Air Cleaner Test Dust) [4]. Precision and accuracy data are given on page 0501-1. Weight stability over 28 days was verified for both blanks and spiked capsules [4]. Independent laboratory testing on blanks and field samples have verified long-term weight stability as well as sampling and analysis uncertainty estimates [4,8].

REFERENCES:

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