EXPLOSIBILITY AND COMBUSTIBILITY PARAMETERS

Method no.:	ID201SG
Matrix:	Bulk material
Procedure:	Obtain a sample by any safe means and seal it in an airtight container. Affix an official sample identification seal on the container. Place the prepared material and required identification papers in a box and ship, following all applicable DOT requirements. A sample of approximately 2 kg (4.5 lb) is preferred.

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Robert Douglas
Jon Rima

Physical Measurements Team
Industrial Hygiene Chemistry Division
OSHA Salt Lake Technical Center
Salt Lake City Utah 84115-1802

The following is a description of a series of tests that are performed to the determine the explosibility and combustibility parameters of a material. Not all tests in this method are appropriate for each sample. The analyst must determine which tests are required for every sample.

1. Percent Through 40 Mesh

   An aliquot of the "as received" material is sieved through a 40 mesh (425 µm) US Standard Testing Sieve. The percent which goes through the sieve is determined as:

   1) Weigh a dust aliquot; sieve through 40 mesh.
   2) Weigh the material passed through the 40 mesh sieve.
   3) Calculate the percentage that passes through a 40 mesh via:

$$\%\ \text{through}\ 40\ \text{mesh} = \frac{(\text{grams through 40 mesh})(100)}{\text{total "as received" aliquot weight}}$$

2. Percent Moisture Content

   Percent moisture content is determined as follows:

   This test method must be modified when the materials being tested would be degraded at 75 °C.

   1) Weigh crucibles and aliquots of material which passed through a 40 mesh sieve.
   2) Dry for twenty-four hours in a drying oven set at 75 °C. Then reweigh the material.
   3) Calculate the moisture content as:

$$\%\ \text{moisture} = \frac{(\text{wet sample weight} - \text{dry sample weight})(100)}{\text{wet sample weight}}$$

3. Percent Combustible Material

   Percent combustible material is determined as follows:

   1) Weigh crucibles and aliquots of material which passed through a 40 mesh sieve.
   2) Ash samples, uncovered, for one hour at 600 °C in a muffle furnace. Then reweigh the residue.
   3) Calculate the combustible material as:

$$\%\ \text{combustible material} = \frac{(\text{wet sample weight} - \text{ash weight})(100)}{\text{wet sample weight}}$$

4. Percent Combustible Dust

   Percent combustible dust is the product of the percent of material which went through a 40 mesh sieve and the percent combustible material. This is calculated as follows:

$$\%\ \text{combustible dust} = (\%\ \text{through 40 mesh})(\%\ \text{combustible material})$$

   Be aware of the distinction between combustible material and combustible dust.

5. Minimum Explosive Concentration

   Minimum explosive concentration is a test for the lower limit of explosibility and is done in the 20-L chamber. Some analytical details include:

1) Test material which has been sieved through 40 mesh.
2) Use material which has been either dried in an oven at 75 °C overnight (if the moisture content is greater than 5%) or kept in a desiccator.
3) Use 2500 J igniters.
4) Plot both the Dp/dt and pressure ratio verses concentration. The minimum concentration is where the MNDp/dt is equal to 1.5 and the pressure ratio is equal to 2.

6. Maximum Normalized Rate of Pressure rise (dP/dt)

Maximum normalized rate of pressure rise (dP/dt) provides a value which may be compared with a dust classification scheme and gives a relative comparison of severity using the following equation:

$$\text{maximum normalized } (Dp/dt) = (dP/dt)_{max} V^{1/3}$$

1) The sample dust is suspended in a 20-liter explosion chamber. (Use 2500 J Sobbe igniters if using the BoM test chamber.)
2) The dust is tested "as received" (except drying, if the moisture content is greater than 5%).
3) Test at three to five dust concentrations, from 500 g/m^3 to about 2500 g/m^3, plotting the found MNDp/dt values verses dust concentration, and reporting the highest value from the plateau of the plot.