Moisture / Free Water Analysis in Fertilizer

1. **Scope**:

   This document provides a standardized procedure for determining the moisture or free water in fertilizer samples.

2. **Principle**:

   The ground sample is dried in an oven and the difference between the initial weight and the dried weight is used to calculate % moisture or free water. Samples are prepared as described in RA-SP-SMPL-PREP. Gypsum samples should not be pre-dried in an oven prior to analysis.

3. **Safety**:

   Care should be taken when removing hot items from ovens.

4. **Equipment**:

   4.1. Analytical balance
   4.2. Drying Ovens – 45^{o}C and 105^{o}C
   4.3. Vacuum oven – 65^{o}C
   4.4. Desiccator
   4.5. Aluminum moisture dishes with covers (VWR cat. # 25420-072)

5. **Moisture Determination in Solid Samples**:

   5.1. Weigh the empty aluminum dish and record the weight.

   5.2. Mix sample thoroughly and weigh 2.0g ± 0.1g into the aluminum dish (record the weight).

   5.3. Dry at 105^{o}C for ~3 hours. Keep covered and store in a desiccator to cool.

   5.4. Re-weigh the cooled sample and calculate the weight loss as the moisture.

6. **Moisture Determination in Liquid Samples**:

6.1. Add ~10.0g sand to an aluminum dish and record the weight.

6.2. Mix sample thoroughly and weigh 2.0g ± 0.1g into the aluminum dish (record the weight).

6.3. Dry in a vacuum oven at 65°C for ~5 hours. Keep covered and store in a desiccator to cool.

6.4. Re-weigh the cooled sample and calculate the weight loss as the moisture.

7. **Free Water Determination**:

7.1. Weigh the empty aluminum dish and record the weight.

7.2. Mix sample thoroughly and weigh 20.0g ± 0.1g into the aluminum dish.

7.3. Dry at 45°C for a minimum of 8 hours or overnight. Keep covered and store in a desiccator to cool.

7.4. Re-weigh the cooled sample and calculate the weight loss as the free water.

8. **Calculations**:

For samples not dried prior to moisture / free water analysis:

$$\% \text{ Moisture} = \frac{(W - D) * 100}{(W - A)}$$

For samples pre-dried prior to moisture analysis

$$\% \text{ Moisture} = \frac{(100 - P) * (W - D)}{(W - A)} + P$$

Where:

W = The weight of the wet sample and the aluminum dish
D = The weight of the dried sample and the aluminum dish
A = The weight of the aluminum dish (including sand, if used)
P = Pre-dry % (for samples pre-dried prior to moisture analysis)

Approvals:

Written By:

Stacy Aylesworth — 2/15/21
Stacy Aylesworth — Date
Senior Environmental Scientist

Approved By:

Maryam Khosravifard — 2/19/21
Maryam Khosravifard — Date
Environmental Program Manager I

Sarva Balachandra — 3/10/21
Sarva Balachandra — Date
Quality Assurance Officer

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