

Gypsum Equivalent

1. **Scope:**

This document provides a procedure for analyzing fertilizer products for gypsum equivalent. This method is not suitable for products that contain other sources of calcium or sulfates.

2. **Principle:**

Samples are prepared according to RA-SP-SMPL-PREP. Samples are analyzed for calcium using ICP-OES (see RA-SP-MINERALS-EXT and RA-SP-MINERALS-PE), for sulfate using IC (see RA-SP-ANIONS) or a combustion sulfur analyzer (see RA-SP-SULF-LECO), and free water. Gypsum equivalent is calculated based on both the calcium and sulfate results on an as received basis.

3. **Safety:**

Read the SDS for all materials before use.

4. **Apparatus and Equipment:**

- 4.1. Drying oven 45°C
- 4.2. Desiccator

5. **Free Water Determination:**

Free water is analyzed on both the unground and ground material to correct for moisture loss during grinding. Free water is reported from the unground portion.

- 5.1. Mix the undried, unground portion thoroughly and weigh 20.00g into an aluminum dish (record weight).
- 5.2. Mix the ground portion thoroughly and weigh 20.00g into a separate aluminum dish (record weight).
- 5.3. Dry at 45°C for a minimum of 8 hours or overnight. Keep covered and store in a desiccator to cool.
- 5.4. Re-weigh the cooled samples and calculate the weight loss as the free water in the material.

6. Equations:

Gypsum equivalent is calculated as received using the percent sulfur-sulfate and percent calcium and both values are reported.

$$\% \text{ Free Water} = \frac{W - D}{W - A}$$

Where:

W = Weight (grams) of undried sample and aluminum dish

D = Weight (grams) of dried sample and aluminum dish

A = Weight (grams) of aluminum dish

$$\% \text{ Gypsum equivalent (sulfur)} = \frac{100 - \% \text{ free water (unground)}}{100 - \% \text{ free water (ground)}} \times \frac{\% \text{ sulfur-sulfate}}{0.1863}$$

$$\% \text{ Gypsum equivalent (calcium)} = \frac{100 - \% \text{ free water (unground)}}{100 - \% \text{ free water (ground)}} \times \frac{\% \text{ calcium}}{0.2328}$$

Where:

$$0.1863 = \frac{\text{Molecular weight Sulfur}}{\text{Molecular weight Gypsum}} = \frac{32.07}{172.17}$$

$$0.2328 = \frac{\text{Molecular weight Calcium}}{\text{Molecular weight Gypsum}} = \frac{40.08}{172.17}$$

Approvals:

Written By:

Stacy Aylesworth
Stacy Aylesworth
Senior Environmental Scientist

12/3/21
Date

Approved By:

Maryam Khosravifard
Maryam Khosravifard
Environmental Program Manager I

12/7/21
Date

Sarva Balachandra
Sarva Balachandra
Quality Assurance Officer

12/10/21
Date

