

Soil Grinding for Elemental Analysis

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Introduction

Soils are a heterogeneous media comprised of mineral and organic matter. To accurately evaluate nutrient concentrations via combustion samples should be homogenized first. Since small amounts of large samples are combusted the subsample must contain all components of the soil. Grinding a subsample of soil ensures that elemental analysis is carried out on a representative fraction of the whole sample (Tan, 2005).

Equipment Needed

Ball mill

Large weigh boat and specimen cup

Scintillation vials

Isopropyl alcohol and Kimwipes (for cleaning)

Weighing paper

Sharpie

Procedure

1. Clean the cups, ball bearings, washers, and tops with isopropyl alcohol and Kimwipes until no dirt is observed on the wipe.
2. Add a subsample of soil (from a well-mixed or split bulk sample) and bearings to cup and hand tighten lid making sure it is straight.
3. Turn on the grinder (Lohse Lab- switch on back right corner).
4. Set timer for grinding to 3 minutes. (Note: 3 minutes is good for most soils but coarser soils may need up to 5 minutes.)
5. Place cup inside the grinder vise making sure to place it properly within the 2 plates before tightening.
6. Hand tighten the large knob FIRST.
7. Hand tighten the wing nut (small knob) SECOND.
8. Close the lid and press Start.
9. If the grinder begins making bad noises (like it's breaking) press Stop to reset the instrument and begin again.
10. Once it has successfully finished and unlocked the lid, loosen the wing nut FIRST.
11. Loosen the large knob SECOND.
12. Check the cup after 3 minutes to see if the soil is to a talc consistency and if so the sample is done. If there are still visible minerals continue grinding for another 2 minutes.
13. Remove the cup and pour the sample onto a piece of weighing paper and remove ball bearings.
14. Pour the sample into a labeled vial and cap.
15. Pound the cup to remove excess soil and clean with isopropyl alcohol and Kimwipes until no dirt is visible on the wipe.

16. Place ball bearings into the specimen cup with enough isopropyl alcohol to cover them and shake to clean.
17. Place ball bearings into the weigh boat and rinse again with isopropyl alcohol and dry with a Kimwipe making sure there is no dirt left on them.
18. Clean the top and washer until there is no dirt showing on the Kimwipe.
19. Do one last wipe with a Kimwipe on all parts to ensure no contamination between samples.
20. Once completed, follow steps 2-19 until all samples are ground.

References

Tan, K.H. (2005). Grinding and Sieving. In *Soil Sampling, Preparation, and Analysis, Second Edition*. Pp. 36-41. Taylor and Francis Group.