

SOP No: SOP-MILL-007	SOP Description: Grinding Rice Samples with a Cyclone Mill
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Author: Sarah Lanning	Replaces Version:
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SOP-MILL-006: Grinding Rice Samples with a Cyclone Mill

Scope:

The outcome of many analytical procedures is dependent on homogeneity of the samples being tested. One way to achieve a homogeneous sample is to grind it into a fine powder. This procedure outlines the steps required to generate a finely ground sample using a Cyclone Mill.

Principle:

The Cyclone Mill grinds material with the use of high-velocity airflow to generate centrifugal forces that propel particulates against an abrasive surface. When the particles become small enough, they are carried by the airflow out of the chamber and are deposited into a sample collection bottle. The high-velocity airflow prevents accumulation of dust inside the chamber, thus minimizing the need to clean the chamber manually, and also dispels heat of friction, minimizing thermal degradation of the samples. A screen is used to ensure uniformity of particle size, by preventing excessively large particles from being expelled through the chamber exit.

Equipment:

Cyclone Mill and accessories (Udy Corporation, Ft. Collins, CO): screen, collection bottle
 Vacuum
 Brushes, picks
 Sample storage vessels

Procedure:

1. Verify that a 0.5 mm screen is in place before using the mill. Use this screen size unless otherwise directed.
2. Place the lid over the mill and secure in place with four latches.
3. Position a sample collection bottle directly under the Cyclone mill spout by depressing the spring-loaded bottle support.
4. Turn the mill on by the switch at the base of the mill. **Allow the mill to reach full speed before adding sample.**
5. Pour the required amount of sample into the bin on the lid and slowly filter the sample into the mill through the bin gate. The gate should be positioned and sample fed through at a rate such that the motor does not slow.
 - a. Generally, sample mass should not exceed 40 g per cycle, so as to avoid build-up in the mill chamber above the collection bottle.
 - b. As the sample is grinding, the collection bottle may fill unevenly. Gently tap the bottle to level out the ground material, making space for the entire sample.
6. After all of the material has emptied from the mill, turn the mill off.

- a. If the mill is going to run continuously (ex. to grind a large quantity of a single sample), press the air inlet plug assembly down while emptying the collection bottle. However, do not block air-flow through the mill for more than a few seconds.
7. Remove the collection bottle by depressing the bottle support and slowly sliding the bottle out from under the spout. Empty the contents of the collection bottle into another storage vessel (ex. plastic ziplock bag).
8. Before grinding the next sample, remove the lid, bin gate, and screen for cleaning. Remove all excess powder from the mill and parts, using a vacuum, brushes, or picks, as necessary.

Special Considerations:

1. If airflow through the mill is reduced or obstructed (indicated by warming of the air and loss of suction into the mill), remove the orange filter media inside the air outlet funnel and vacuum or shake vigorously to expel dust.
2. If powder is seeping through the rim of the lid, check for wear on the lid gasket or o-rings on the under-side of the lid. Replacement parts are located in the rice processing lab.
3. If it is necessary to turn the mill off before all material is expelled, the grinding chamber must be cleaned manually. Remove the impeller and vacuum underneath it to remove dust that has accumulated. **Do not use liquids to clean the chamber.**
4. If it is noted that dust is clinging to the inside of the chamber, the inside surface may be wiped with a cloth moistened with Antistatic Solution. The surface must dry completely before operating the mill.