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Angle of Repose and Effect of Glidants

Experiment 9 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To compare powder-pile angle with and without an assigned glidant.

Principle

A powder cone's height and base radius define its repose angle under the chosen formation method. Friction, cohesion, particle size and humidity influence the result. A glidant can alter the measured flow pattern at a suitable concentration.

Requirements

- Assigned powder and glidant concentration, for example a supervised 0.5% w/w teaching blend.
- Fixed funnel setup, flat base, ruler, balance and mixing vessel.

Procedure

1. Control setup

Fix the funnel geometry, outlet-to-base position, powder amount, base surface and room conditions. Record whether height is fixed or adjusted by the prescribed method.

2. Untreated powder

Allow powder to form a cone without vibration or external pushing. Measure height h and two perpendicular base diameters.

3. Calculate radius

Use half the mean diameter as radius r. Repeat pile formation and record each result.

4. Prepare blend

Weigh the prescribed glidant and mix by a controlled method. Keep the same total test mass and setup.

5. Repeat

Form replicate cones for the treated powder and record h, r and any irregularity or failure to flow.

6. Compare

Calculate $\theta = \arctan(h/r)$ in degrees. Compare conditions and replicate spread; do not assume that more glidant always improves flow.

Observations and Record

Powder condition	h / r (same units)	Angle θ (degrees)
Without glidant	_____	_____
With glidant	_____	_____
Replicate / room conditions	_____	_____

Worked Example

The numbers below are illustrative; enter your own observations in the record.

- Untreated h = 3.0 cm and r = 5.0 cm gives θ = arctan(0.60) = 30.96°.
- Treated h = 2.5 cm and r = 5.0 cm gives θ = 26.57° under the same method.

Result

Record the observed outcome and calculated value, with units. State whether the stated laboratory specification was met; do not copy the worked example as your result.

Precautions

- Use the instructor's assigned material and apparatus; record actual temperature and units with every measured property.
- Check instrument calibration and use repeat readings rather than a single convenient result.
- Compare a marketed teaching formulation only under the same method and conditions; its excipients can change the property.

Viva Questions and Answers

1. Why use radius rather than diameter?

The cone geometry uses h/r.

2. Why control humidity?

Moisture can change interparticle adhesion.

3. Does one lower angle prove all processing problems are solved?

No. Other flow, segregation and compaction properties still matter.

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