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Particle Size Distribution by Sieving

Experiment 6 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To determine a mass-based size distribution of a powder using a sieve stack.

Principle

Particles are separated by their ability to pass defined openings. The result is a mass distribution of sieve fractions, influenced by particle shape, agglomeration and sieving conditions. It is different from a number-based microscopy distribution.

Requirements

- Dry representative teaching powder, verified sieve openings and collection pan.
- Balance, sieve shaker/timer, brush and appropriate dust control.

Procedure

1. Prepare

Record the initial powder mass, moisture condition and sieve openings in micrometres. Assemble largest opening at the top and a pan below.

2. Sieve

Load a suitable quantity, close the stack and shake for the prescribed time/amplitude. Avoid overloading and forcing particles through openings.

3. Weigh fractions

Weigh retained material on each sieve and in the pan. Account for material loss and record recovered total.

4. Calculate

Calculate each fraction percentage using the stated denominator. Compare recovered and initial masses to check the mass balance.

5. Graph

Plot percent retained and/or cumulative percent undersize against a clearly defined size axis. State any logarithmic scale.

6. Mean size

For bounded fractions, use assigned representative sizes such as arithmetic midpoints. Open-ended top/pan fractions need justified bounds before a mean is calculated.

Observations and Record

Bounded interval (µm)	Mass / % retained	Representative d (µm)
300-500	20 g / 20%	400
150-300	50 g / 50%	225
75-150	30 g / 30%	112.5

Worked Example

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

- Illustrative 100 g dataset with all material inside the listed bounded intervals: dmass = $\Sigma m_i d_i / \Sigma m_i$.
- dmass = (20×400 + 50×225 + 30×112.5)/100 = 226.25 µm.
- If material also occurs above 500 µm or below 75 µm, report those fractions and revise the calculation; do not assign an unjustified pan diameter.

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.
- Minimise airborne powder; do not brush strongly against or damage sieve meshes.

Viva Questions and Answers

1. Why check recovered mass?

Loss can distort the percentage distribution.

2. What kind of average is this?

A mass-weighted average using assumed representative fraction sizes.

3. Why can elongated particles mislead?

Passage depends on orientation as well as nominal dimensions.

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