

Determination of Bulk Density, True Density and Porosity

Practical 03 | Physical Pharmaceutics II

Aim

To determine Bulk Density, True Density and Porosity, and interpret the recorded observations.

Principle

- Bulk density includes interparticle void space; true density refers to the material itself under the stated measurement method.
- The property is obtained from a defined observable under controlled conditions.
- Replicate measurements, instrument checks and consistent units are needed before comparison.

Materials and Apparatus

- Assigned powder, graduated cylinder and approved true-density method or records.
- Assigned test material and calibration or comparison material.
- The apparatus specified for this property, a balance or volumetric equipment where relevant, and a record sheet.

Method

1. Identify the measured property, units and controlled variables before setting up the apparatus.
2. Check the instrument, zero or calibration and record the relevant operating conditions.
3. Prepare a representative measured portion without changing its intended composition.
4. Obtain the readings specified for the property and repeat under the same conditions.
5. Calculate the required property, including corrections stated for the apparatus or method.
6. Summarize the replicate results and explain the effect of the variable studied.

Observation Record

Complete this record using actual laboratory findings or the provided teaching data.

Observation / parameter	Record / finding
Powder mass	_____
Bulk volume	_____
True volume/density	_____
Porosity	_____

Calculations and Interpretation

- Bulk density = mass/bulk volume.
- True density = mass/true material volume.
- Interparticle porosity = $1 - \text{bulk density/true density}$; multiply by 100 for percentage.

Worked Illustration

Illustration: 25.0 g in a 50.0 mL bulk volume has bulk density 0.500 g/mL. If true density is 1.25 g/mL, calculated interparticle porosity is 60.0%.

The values in this illustration are for calculation practice.

Result

Record the actual finding, calculated value with units where relevant, and a conclusion supported by the observations.

Finding: _____

Conclusion: _____

Precautions

- Keep temperature and test conditions consistent across comparative readings.
- Record raw readings before rounding calculated values.
- Do not compare results obtained with different methods as if they were interchangeable.

Viva Questions

1. Why control the test conditions?

A change in conditions may alter the measured property independently of the intended variable.

2. Why retain replicate readings?

They show repeatability and help identify an anomalous measurement.

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