

# Porosity Measurement and Control Cheat Sheet

## 1. Types of Porosity

- Interparticle Porosity: Voids between loosely packed particles.
- Intraparticle Porosity: Voids within the particles.
- Open vs Closed Porosity: Open allows fluid passage; closed does not.

## 2. Measurement Techniques

- Mercury Intrusion Porosimetry: Good for rigid, large-pore samples.
- BET Gas Adsorption: Ideal for microporous powders like activated carbon.
- Helium Pycnometry: Calculates porosity via density comparison.
- Micro-CT & Image Analysis: Visualize and quantify 3D pore networks.
- Bulk Density Estimation: Quick process control method.

## 3. Control Strategies

- Adjust particle size distribution to influence packing.
- Modify binder content and drying rate to control porosity formation.
- Fine-tune sintering temperature and compression force.

## 4. Industry Examples

- Pharmaceuticals: Porosity affects dissolution and tablet strength.
- Ceramics: Balances permeability and thermal resistance.
- Filtration Media: Controls flow and retention rates.
- Catalysts: Porosity enhances active surface area.
- 3D Printed Parts: Structural quality depends on closed/open porosity.

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## 5. Troubleshooting Checklist

- Batch variation? Check packing consistency.
- Unexpected strength loss? Review pore collapse or drying issues.
- Poor permeability? Verify sintering and binder levels.
- Conflicting results? Ensure correct method for pore type.