

## Determining Porosity

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### 1) Density Method

- measure mass  $M$  and volume  $V$  of sample
- calculate density  $\rho = M/V$

compare  $\rho$  with known density of solid grains  $\rho_s$

$$M = \rho_s V_s = \rho_s (1 - \phi) V$$

equate  $M$  and solve for  $\phi$

$$\phi = \frac{\rho_s - \rho}{\rho_s}$$

## Typical Porosities

### Sedimentary

1. clastic rocks (sandstone, shale, etc.)  $\phi \approx 0.5$   
random packing of uniform spheres  $\phi = 0.4$
2. evaporites (salt deposits)  $\phi \approx 10^{-3}$

### Igneous

1. intrusive rocks (like granite)  $\phi \approx 10^{-3}$
2. extrusive rocks -  $\phi > 10^{-3}$
3. ash deposits  $\phi \approx 0.5$

## Clastic Rocks

In clastic (sedimentary) rocks the initial porosity depends on

1. grain size - **surface** friction
2. shape - **more irregular** shapes have higher porosity
3. distribution - uniform size have higher porosity

### Evolution of Porosity

1. consolidation - slip and rotation of grains
2. compaction - (plastic) deformation of grains
3. dissolution and precipitation