Adsorbent Internal Surface Area from Porosity and Pore Size

Pore volume and internal surface area of a porous adsorbent from particle porosity, particle density and pore diameter, taking cylindrical pores.

Method: Cylindrical pore geometry A/V = 4/d with pore volume ε/ρ

Input parameters

Unit system: SI

Parameter	Value	Unit
Particle porosity (pore volume share)	60.000	%
Particle (apparent) density	800.00	kg/m³
Pore diameter	2.0000	nm

Calculated results

Parameter	Value	Unit
Pore volume per mass	0.75000	L/kg
Surface-to-pore-volume ratio 4/d	2.0000e+09	1/m
Internal surface area	1,500.0	m²/g

Notes for this case

• Cylindrical pores: area 2πRH and volume πR²H per pore, so A/V = 2/R = 4/d. Real adsorbents have a spread of pore sizes; micropores (< 2 nm) carry most of the area.

Formula and method

$$V_{ad} = \frac{\varepsilon_p}{\rho_p}, \quad \frac{A_{ad}}{V_{ad}} = \frac{2\pi RH}{\pi R^2 H} = \frac{4}{d_{pore}}, \quad A_{ad} = \frac{4V_{ad}}{d_{pore}}$$

Variables

ε_p	Particle porosity (pore volume share)	-
ρ_p	Particle (apparent) density	kg/m³
d_{pore}	Pore diameter	m
V_{ad}	Pore volume per mass	m³/kg
A_{ad}/V_{ad}	Surface-to-pore-volume ratio 4/d	1/m
A_{ad}	Internal surface area	m²/kg

Method and standards

Geometric surface area of uniform cylindrical pores.

Assumptions and limits

- Uniform cylindrical pores; external area neglected.

References

Cylindrical pore geometry A/V = 4/d with pore volume ε/ρ

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/drinking-water/adsorbent-pore-surface-area

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Reopens the calculator with the inputs of this report.