

Porosities of natural and manufactured rock and mineral based materials

This table was originally produced by David Thompson (Thompson, 1979) in an article about porosity and permeability and has been updated. It lists the range of porosities and bulk densities of various common materials and provides information that teachers may find it useful to have available when discussing porosity with students.

Table 1: Porosities and bulk densities of various common materials.

	Effective porosity %	Bulk density kg m ⁻³
Igneous rocks		
Granite	0.5 - 1.5	2600 - 2900
Rhyolite ¹	4.0 - 6.0	2400 - 2600
Andesite ¹	10.0 - 15.0	2200 - 2300
Gabbro ¹	0.1 - 0.2	2800 - 3100
Dolerite ¹	0.1 - 0.5	2700 - 3050
Basalt ¹	0.1 - 1.0	2800 - 2900
Vesicular basalt	very small	Not determined
Pumice	Very small	<1000
Sedimentary rocks		
Sandstone ¹	5.0 - 25.0	2000 - 2600
Shale ¹	10.0 - 30.0	2000 - 2400
Limestone ¹	5.0 - 20.0	2200 - 2600
Dolomite ¹	1.0 - 5.0	2500 - 2600
Coal ²	2.0 - 12.0	1000 - 1800
Metamorphic rocks		
Gneiss ¹	0.5 - 1.5	2800 - 3000
Marble ¹	0.5 - 2.0	2600 - 2700
Metaquartzite ¹	0.1 - 0.5	2600 - 2700
Slate ¹	0.1 - 0.5	2600 - 2700
Manufactured rocks & minerals		
Granular crushed rock ²	44.0 - 45.0	not determined
Brick ²	12.0 - 34.0	not determined
Concrete (ordinary mix) ²	2.0 - 7.0	not determined
Fibre glass ²	88.0 - 93.0	not determined
Soils		
Sandy loams ³	50.0 - 54.0	not determined

¹ From Attewell & Farmer (1975 p. 13); ² From Scheidegger (1957 p. 187); ³ From Pettijohn (1957 p. 353)

References

- Attewell, P.B. & Farmer, I.W. (1975) *Engineering Geology*. London: Chapman Hall.
- Lamur, A. & Kendrick, J. (2019) Determining the porosity and permeability of rocks: A benchtop method for A-Level classrooms. *Teaching Earth Sciences* **44** (2), pp.14 – 18.
- Pettijohn, F.J. (1957) *Sedimentary Rocks*. New York: Harper.
- Scheidegger, A.E. (1957) *The Physics of Flow through Porous Media*. New York: MacMillan.
- Thompson, D. (1979) Experiments on porosity and permeability: part 1. *Geology Teaching* **4** (1), pp.26 – 31.
1. Practical guidelines for Lamur & Kendrick's method for determining porosity and permeability of rocks and excel spreadsheet that calculates the porosity and permeability of rocks.
<https://geohubliverpool.org.uk/resource/porosity-permeability>
[Accessed December 2019]
 2. Notes and activities on water storage in rocks.
https://serc.carleton.edu/integrate/teaching_materials/water_science_society/student_materials/914
[Accessed December 2019]