

## Hall's Notes and Queries

### NQ2

#### Impact

In two papers<sup>1,2</sup> and then again more briefly in WT3e<sup>3</sup>, we have emphasised the value of the solid density in reporting the porosity of inorganic materials.

The solid density  $\rho_s$  can be estimated from the measurements obtained in the standard Archimedes method for porosity. Several standards fail to mention this, and  $\rho_s$  is rarely reported in publications on the porosity of construction materials. As we have noted,  $\rho_s$  provides an important quality-control check on the measured bulk density  $\rho_b$  and porosity  $f$  since it should be consistent with the material composition. The composition is often known from direct analysis or from prior work on similar materials. The so-called **composite mineral density** can then be calculated from tabulated densities of the components. For example in most calcitic limestones, the value of the solid density is close to the crystallographic density of calcite, 2709 kg/m<sup>3</sup>. In such limestones the porosity can be estimated to good accuracy just from the measured bulk density.

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<sup>1</sup>C Hall & A Hamilton (2015). Porosity–density relations in stone and brick materials. *Materials and Structures*, 48(5), 1265-1271.

<sup>2</sup>C Hall & A Hamilton (2016). Porosities of building limestones: using the solid density to assess data quality. *Materials and Structures*, v49(10), 3969-3979.

<sup>3</sup>C Hall & W D Hoff (2021) *Water transport in brick, stone and concrete*, third edition, CRC Press.

Over the years since publication, the papers mentioned have been well cited, but have had no obvious impact on the practice of reporting porosity data. It is therefore pleasing to see a paper<sup>4</sup> from a different field that makes use of the relation between bulk density, solid density, porosity and mineral composition, and to spectacular effect (here 3.7 million calculated porosities from ocean floor drill cores).

Take impact wherever it appears, and be grateful.

Christopher Hall  
17 April 2024

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<sup>4</sup>L B Childress, G D Acton, V P Percuoco & M Hastedt (2024). The LILY database: Linking lithology to IODP physical, chemical, and magnetic properties data. *Geochemistry, Geophysics, Geosystems*, v25, e2023GC011287.