



Relationship between physico-mechanical properties and textural features in calcarenite rocks

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Calcarenite rocks have been widely used as building stones in many historical monuments due to their workability, aesthetic appeal and availability. Due to their physico-mechanical properties and textural features, these rocks, when affected by environmental pollution, marine aerosols and meteoric water precipitation, show a reduced ability to maintain their characteristics of strength, appearance, and resistance to decay over a considerable period of time.

The durability of soft and porous calcarenites, in fact, depends not only on their geographic location and exposure to weathering but also on their mechanical strength and hydraulic behaviour in terms of properties as water absorption, capillarity, permeability and porosity.

In this context, textural, physical and mechanical properties are analysed on different calcarenites. The study involves, particularly, microtextural analysis on thin sections using optical petrographic microscopy, and evaluation of index parameters and uniaxial compressive strength by means of standard geotechnical laboratory tests. Particular attention is given to pore size distribution by mercury intrusion porosimetry, effective porosity and degree of saturation by water absorption determinations, grain size frequency distribution by traditional sieve and sedimentation analysis on disaggregated materials. Permeability is evaluated in both the unsaturated and saturated state. The relationships between the experimental data are discussed using graphs and statistical regression analysis. A comparison between results shows a good correlations between the parameters obtained and underlines the importance of cross-dimensional analysis including physical, mechanical and petrographic studies to assess the behaviour of the calcarenites as building stones, and their susceptibility to weathering.

The examined calcarenites, sampled from different quarry districts in Apulia and Basilicata (southern Italy), comprise fine, medium and coarse grained varieties belonging to the Calcarenite di Gravina Fm. (upper Pliocene-lower Pleistocene). This formation rests on Mesozoic-Cenozoic limestone successions (exceeding 6000 meters in thickness) of the Apulia Foreland and constitutes continuous exposure of intrabasin biocalcarenes and biocalcirudites and/or terrigenous calcarenites with a carbonate content approximately between 90% and 99%.