Effect of consolidation treatments on mechanical behaviour of sandstone

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HIGHLIGHTS

• Consolidation on sandstones with ethyl silicates increased mechanical parameters.
• Strength values of monotonic and cyclic compression are similar after treatments.
• A model describes compressive mechanical behaviour of consolidated building stones.

ARTICLE INFO

Article history:
Received 5 February 2014
Received in revised form 2 August 2014
Accepted 5 August 2014

Keywords:
Monuments
Sandstone
Ethyl silicates
Compression
Consolidation effect

ABSTRACT

Experimental research was carried out about ethyl silicate applications on sandstone samples. Consolidation was assessed by drilling strength, impregnation depth and also monotonic and cyclic uniaxial compressive tests in order to evaluate the compressive mechanical behaviour of treated sandstone. The stress–strain compression diagrams showed a significant increase in the values of mechanical parameters after consolidation treatments. The difference in compressive strength values between monotonic and cyclic compression disappears after the consolidation treatments. An equation of consolidation effect was obtained from an analytical model by means of compressive behaviour assessed by stress–strain diagrams.

These sandstone samples have values of porosity similar to the more weathered variety of sandstone found in facades of monuments in the village of Arousa da Baleia, in the western region of Portugal. The most important degradation pattern found on sandstone building stones is abelization caused by salt crystallization since the Middle Ages.

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