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Correlation of the Pressure Stimulated Current (PSC) with the applied uniaxial stress on marble rock samples and Portland type cement–OPC, from low stress levels up to fracture*.

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In this work are presented the results of laboratory experiments for the inspection of electric signal emissions on marble and cement samples during the application of an increasing at a constant time-rate uniaxial stress up to fracture.

The electric signals that are received and investigated are weak electric currents under the name Pressure Stimulated Currents (PSC). The samples used were: a) Dionysos marble that had come from Mt. Penteli (Greece) and Portland type cement–OPC, whose sand grains had a diameter varying between 0.08mm and 2mm.

The PSC values during the temporally varying uniaxial stress S, were correlated with the normalised stress values s=S/S_{max}, where S_{max} is the ultimate compressional stress. The PSC diagrams, both for marble samples and for cement samples show up three regions in which the Pressure Stimulated Currents increase with the normalised stress value s.

In the first region where s<0.65 and in the region where 0.65<s<0.85 to 0.9) an exponential law of the form $I = I_0 \cdot \exp(a \cdot s)$ seems to dominate for different values of the parameters I_0 and a. In the region where s<0.65, the material samples are in a state of no-damage and the value of the exponent factor a is approximately 2. In the region where 0.65<s<0.85, the material samples exhibit a non-linear mechanical behaviour and micro-cracks occur and the value of the observed PSC increases intensely (a=20 to 25). Finally, in the third region (s>0.9 approximately), the PSC keeps on increasing at a lower rate and gets to a peak in the vicinity of the ultimate state. Based on the above

it is possible to quantify damages occurring in the mass of the sample from the form on the curve f = I(s) and from the value of the exponent factor a.

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