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Concurrent recordings of Electrical Current Emissions and Acoustic Emissions detected from marble specimens subjected to mechanical stress up to fracture

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The emission of electrical signals during the application of mechanical stress on brittle geo-materials (the so called Pressure Stimulated Current - PSC[1,2]), provides significant information regarding the mechanical status of the studied rock sample, since PSCs are originated as a result of the opening of cracks and microfractures[3]. The latter mechanism for the creation of PSCs it is straightforward to associated with the recording of acoustic emissions (AE). To justify the common origin of PSCs and AE due to opening of cracks, a combined study was performed implicating the concurrent recording of electric current emissions and AE on marble samples when they are subjected to linearly increasing mechanical load up to the fracture. The electric signal detected is recorded by an ultra sensitive electrometer (Keithley 6514). The sensor used for detecting the electric current is a pair of gold plated electrodes adapted bilaterally on the sample found under axial mechanical stress[4]. The AE were recorded through the Physical Acoustics PCI-2 Acquisition System. The experimental results prove the strong association of the recorded electrical signals and the corresponding acoustic emissions justifying their common origin due to opening of microfractures. Furthermore, when the applied mechanical load exceeds the yield stress then an increasing of PSCs amplitude along with that of AE rate is observed.
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