



AC conductivity measurements on rock samples subjected to constant uniaxial compressional stress

I. Stavrakas, C. Anastasiadis, K. Ninos, D. Triantis

Laboratory of Electric Properties of Materials, Department of Electronics, Technological Educational Institution of Athens

ilias@ee.teiath.gr, cimon@ee.teiath.gr, kninos@ee.teiath.gr, triantis@ee.teiath.gr

Several experimental methodologies have been proposed to examine the mechanical status of brittle geomaterials. Electric measurements are non-destructive tests that are applicable in the study of the impact of externally applied stress on the mechanical status of materials. In this work marble samples were subjected to uniaxial compressional stress at various levels and the ac conductivity was measured at the frequencies 10kHz and 100kHz. All samples were extracted from the same rock mass and were prepared for the experiments in order to have the same characteristics. They were divided into groups and each group suffered compressional uniaxial stress at a predefined level. The selected levels varied from low stress up to the vicinity of fracture. The ac conductivity of each prestressed sample was then measured. The same experimental procedure was repeated for similar prestressed samples after dehydration. All conductivity measurements were studied with respect to the stress strain curves of the used samples.

It was found that for samples that suffered stress up to 30% of the ultimate compressional stress strength, the ac conductivity decreases for increasing stress. This can be attributed to the pores closing processes that take place in this stress range and the consequent limitation of the conductive paths in the bulk of the sample. The ac conductivity of the samples that suffered stress in the range between 30% and 70% of the ultimate compressional stress strength, increases significantly with increasing stress. This increase can be attributed to the crack propagation mechanisms that create ad-

ditional conductive paths at their edges. Finally, for the samples that suffered stress greater than the 70% of the ultimate compressional stress strength the ac conductivity appears to maintain high values. The behavior of the conductivity of the dehydrated samples was similar but exhibited lower magnitudes. The lower magnitude of the changes of the ac conductivity can be attributed to the absence of water in the bulk of the sample. It can be concluded that ac conductivity measurements can provide information regarding the mechanical status of marble samples that have suffered stress enough to create damages in their bulk.

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