



Dielectric non destructive testing for rock characterization in natural stone industry and cultural heritage

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Dielectric constant measurement has been used in rocks characterization, mainly for exploration objective in geophysics, particularly related to ground penetration radar characterization in ranges of 10 MHz to 1 GHz. However, few data have been collected for loss factor.

Complex permittivity (dielectric constant and loss factor) characterization in rock provide information about mineralogical composition as well as other petrophysic parameters related to the quality, such as fabric parameters, mineralogical distribution, humidity.

A study was performed in the frequency of 2,45GHz by using a portable kit for dielectric device based on an open coaxial probe. In situ measurements were made of natural stone marble and granite on selected industrial slabs and building stone. A mapping of their complex permittivity was performed and evaluated, and variations in composition and textures were identified, showing the variability with the mineral composition, metal ore minerals content and fabric.

Dielectric constant was a parameter more sensible to rock forming minerals composition, particularly in granites for QAPF-composition (quartz-alkali feldspar-plagioclases-feldspathoids) and in marbles for calcite-dolomite-silicates. Loss factor shown a high sensibility to fabric and minerals of alteration.

Results showed that the dielectric properties can be used as a powerful tool for petrographic characterization of building stones in two areas of application: a) in cultural heritage diagnosis to estimate the quality and alteration of the stone, an b) in industrial application for quality control and industrial microwave processing.