Abstract

The natural reservoirs of decorative stones in India have extreme commercial importance. The
decorative stones possess a wide variety of colours and textures. The present paper envisages the dielectric behavior of such variety of stones specific to this region at X-band microwave frequencies. A measurement setup at X-band was setup for the experimental determination of relative dielectric constant of various decorative stones. The regular pattern of the relative dielectric constant varying with microwave spectrum is revealed. The Relative dielectric constant is correlated with the type; structure and chemical composition of marble are discussed. The results show that the relative dielectric constant is related to the frequency when measured in the frequency range of 8.8 – 12.2 GHz. The real part of the relative dielectric constant among different type of stone changes in the range of 3.5000 – 8.0194. The regular decrease in relative dielectric constant with increase in frequency. The chemical composition gives somewhat complex relation as the impurities are different in different colour stones. The imaginary parts of relative dielectric constant shows that loss tangent also decreases with increase in frequency in the range of 0.11088 – 0.131975. The loss tangents are different for different types of stones as their chemical composition varies. Further, the relative dielectric constants (both real and imaginary) were determined for wet stones also, smooth decline of dielectric constant with increase in frequency. The measurement data may be of vital importance for microwave remote sensing applications.

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Index Terms

Computer Science
Signal Processing

Keywords
Dielectric Constant
Dielectric Loss
Marble
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