

Measured Dielectric Permittivity of Contaminated Sandy Soil at Microwave Frequency

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ABSTRACT Measurement of dielectric permittivity of soil has been studied by many researchers. However, few studies have been conducted on contaminated soil. The motivation of the present study is to investigate the behavior of sandy soil contaminated by lubricant oil at microwave frequency. Two different artificially prepared soil samples are measured in the laboratory. The measurement of the complex permittivity of soil samples is reported in the frequency range 500 MHz – 4 GHz using open-ended coaxial probe technique. Measurements are carried out using a dielectric assessment system associated with an automatic network analyzer and a dielectric probe connected to a computer. The experimental set up is described and the system response is obtained. It is observed that the complex permittivity of the soil is associated with the contamination. The measurement results show that the change in the dielectric loss of dry sand before and after lubricant oil contamination is quite significant. Measuring these dielectric contrasts provide a basis for using ground-penetrating radar or other high-frequency electromagnetic sensors in the detection of soil contamination.

KEYWORDS Microwave frequency, dielectric properties, permittivity measurement, contaminated sandy soil.

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