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A study on characterization of physical parameter of unsaturated porous media using dielectric measurement system

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The permeation movements of groundwater recharge and contaminate materials receive a great effect due to porosity and effective porosity of porous media which is composing underground consisted of saturation and unsaturated states. This study developed Frequency Domain Reflectometry(FDR) system and measurement sensor, and then carried out the laboratory experiments to measure effective porosity for unsaturated porous media. Also, I suggested dielectric mixing models(DMMs) which can calculate the effective porosity from relation of measured dielectric constants. In the experimental results the extent range of effective porosity of standard sand and river sand which are unsaturated soil sample were measured in about 65∼85% for porosity. In relation of effective porosity and porosity, especially, effective porosity confirmed that displays decreasing a little tendency as porosity increases. This is because unsaturated soil did not reach in saturation enough by air of very small amount that exist in pore between soil particles.

Measurement of dielectric constant of soil material is possible to measure an interference wave generated by between incidence wave and reflection wave which are detected to electro-magnetic wave through the directional coupler at the high frequency range, 0.1 to 1.6GHz, by FDR system. The obtained experimental results verified that the technique is very promising for non-destructive and continuous soil volumetric water content measurement monitoring in a laboratory. The relationship between the soil volumetric water content and the dielectric constant of soil media(standard sand)was expressed by a single regression curve independent of soil texture at a small experi-

mental error. Also the derived regression curve coincided well with that obtained by Topp et al(1980) curve.

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