A small and slim coaxial probe for single rice grain moisture sensing

Abstract

A moisture detection of single rice grains using a slim and small open-ended coaxial probe is presented. The coaxial probe is suitable for the nondestructive measurement of moisture values in the rice grains ranging from from 9.5% to 26%. Empirical polynomial models are developed to predict the gravimetric moisture content of rice based on measured reflection coefficients using a vector network analyzer. The relationship between the reflection coefficient and relative permittivity were also created using a regression method and expressed in a polynomial model, whose model coefficients were obtained by fitting the data from Finite Element-based simulation. Besides, the designed single rice grain sample holder and experimental set-up were shown. The measurement of single rice grains in this study is more precise compared to the measurement in conventional bulk rice grains, as the random air gap present in the bulk rice grains is excluded.

Keyword: Gravimetric moisture content; Measured reflection coefficient; Microwave measurement techniques; Relative permittivity; Single rice grain; Small open-ended coaxial probe; Transmission line