Microwave Dielectric properties of Honey-water mixture at 50 GHz using Time Domain Spectroscopy

S. M. Sabnis 1 , P. A. Bhadane2, D. N. Rander 1 , K. S. Kanse 1 , Y.S. Joshi 1\* , A. C. Kumbharkhane3

**1** Deptt. of Physics and Electronics, Lal Bahadur Shastri Mahavidyalaya, Dharmabad, Dist. Nanded (MS),India, **2**Department of Physics, KLE Science and Commerce College, navi Mumai, **3**School of Physical Sciences, Swami Ramanand Teerth Marathwada University, Nanded (MS) India

\* Corresponding author Email address: **yjosh@rediffmail.com**

**Abstract**. The current study envisages the use of time domain spectrometry technique to study the dielectric properties of honey-water mixtures in the temperature range of 5 ℃ to 25 ℃ amidst the frequency range of 10 MHz to 50 GHz. Interpretation of physical quality parameters of the honey samples is measured with chemical methods. TDR technique provides a quick yet very reliable and inexpensive solution to calibrate the quality aspects of the honey samples. The analysis is done using quantified statistical data towards physical dielectric properties like dielectric permittivity, relaxation time, dielectric loss using Cole-Davidson model.

Conductivity behaviour of pure and water mixed samples is discussed in the paper. The factors inverse nature of dielectric loss factor, variance in the electrical conductivity factor is also calibrated. Insightful analysis towards dielectric properties of honey-water mixtures is done using quantified data aspects like static permittivity (εo) and average relaxation time (τ). Molecular structural variances and their concurrency towards thermodynamic parameters like free Energy (ΔFτ ), enthalpy (ΔHτ ) and entropy of activation (ΔSτ ) are also envisaged.

**Key words**: Dielectric Permittivity, dielectric Loss, dielectric relaxation, time domain reflectometry (TDR), physio-chemical properties

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