

Dielectric properties of rubber wood at microwave frequencies measured with an open-ended coaxial line

ABSTRACT

Dielectric properties of rubber wood were studied at different microwave frequencies, structural directions, and moisture contents using an open-ended coaxial probe. Frequencies used for this study were 1.00, 2.45, 6.0, 8.0, 10.0, 14.0, and 17.0 GHz; and the measurements were carried out at a room temperature of 22-24°C. The dielectric constant and dielectric loss factor were found to increase continuously as the moisture content increased. A sharp rise in the dielectric constant and dielectric loss factor was obtained at high moisture content, and the trends became concave upward. As the frequency increased, the dielectric constant decreased, whereas the dielectric loss factor increased. The dielectric loss factor remained almost constant above the frequency of 6 GHz for all structural directions. Fourth-order polynomial equations were found suitable for the best fit curve. Dielectric constant and dielectric loss factor of oven-dry wood were higher in the longitudinal direction than in the radial and tangential directions. With respect to frequency, the dielectric loss factor exhibited a peak value around 10 GHz. The dielectric anisotropy of wood may be attributed to the microscopic and macroscopic molecular structures as well as to chemical constituents of wood.

Keyword: Dielectric constant; Dielectric loss factor; *Hevea brasiliensis*; Microwave frequencies; Moisture content; Rubber wood; Structural direction