

SIGNIFICANT EFFECT OF WATER PARTICLE DISTRIBUTION AND SHAPE ON COLE-COLE MODELING OF BIOLOGICAL TISSUES

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ABSTRACT In this paper, the dependence of Cole–Cole fitting parameters on either water content or distribution is studied for different geometries of water particle’s shape in a fat medium. By taking account of water particle’s shape, the earlier developed T-matrix multiple scattering theory has been successfully used to extract the appropriate fitting parameters of fat tissues at microwave frequency. The parameters of a single-pole Cole-Cole model are found by least-squares minimization. Their dependence on both water content as well as water particle’s shape is tabulated. The effective permittivity obtained for different geometries of water particles through multiple scattering theory is coupled with experimental data reported in literature. The results obtained in the current study provide new insights to extract more detailed information about a biological tissue from its dielectric permittivity and interpret variations in the experimental data.

KEYWORDS Fat Tissues, Complex Permittivity, Cole-Cole Model, Free Water, Multiple Scattering Theory.

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