Abstracts

Dielectric and geometric dependence of electric field and power distribution in a waveguide heterogeneously filled with lossy dielectrics

L. Outifa, M. Delmotte and H. Jullien. "Dielectric and geometric dependence of electric field and power distribution in a waveguide heterogeneously filled with lossy dielectrics." 1997 Transactions on Microwave Theory and Techniques 45.8 (Aug. 1997, Part I [T-MTT]): 1154-1161.

In microwave processing of dielectric materials which completely fill a waveguide, the distribution of the electric field within the material needs to be known. This paper presents the theoretical conditions for the microwave cure of large pieces, the size of which is more than the wavelength. The mathematical description of heterogeneously multilayer-filled waveguides presents certain difficulties because of the involved transcendental equations. A computer treatment to determine the electric-field spatial distribution is developed. The influence of the dielectric constants and the thickness of the dielectric materials on the spatial distribution of the electric field and power flow in each layer is studied. In particular, the field strength is enhanced in the dielectric with the highest permittivity. A numerical resolution of the transcendental equations defining the cutoff frequencies of propagation modes allows one to enumerate the modes, which can successively appear in a dielectric-loaded waveguide as functions of dielectric and geometric parameters. The attenuation constant and the microwave power dissipated in each material are determined. A balance sheet of energy is established.

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