MRS 1996 Spring Meeting
Symposium O: Microwave Processing of Materials V

COMPARISON OF FINITE-DIFFERENCE AND ANALYTIC MICROWAVE CALCULATION METHODS

F. Friedlander, CPI Microwave Power Tube Products, Palo Alto, CA 94304; and H. W. Jackson, M. Barmatz and P. Wagner, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109

ABSTRACT

Normal modes and power absorption distributions in microwave cavities containing lossy dielectric samples were calculated by a commercially available finite-difference electromagnetic solver and by numerical evaluation of exact analytic expressions for problems of interest in materials processing. Results obtained by the two methods applied to identical physical situations were compared. Those comparisons will be discussed for conditions where the complex dielectric constant in the sample is uniform and also for cases where it is spatially varying. Comparisons will also be presented for two- and three-dimensional spatial variations of the fields, such as in cylindrical TM0n0 modes and hybrid 111 modes, respectively. Two methods for treating power absorption with the finite-difference approach were applied. Correlations between mesh size and accuracy in the finite difference approach will be presented. Our studies validate the accuracy of the finite-difference electromagnetic solver. Implications of the results will be discussed within the context of optimizing the selection of meshes and using the solver efficiently. Relative advantages of the analytic and finite-difference methods will be discussed. [Work partially supported by NASA].