Title: Optimization of Slotted Waveguides for 2.45 GHz Applicators

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Text:

Volumetric microwave heating shows clear advantages over conventional heating in applications like: food heating, vacuum drying, ceramics and metallic powder sintering, dielectrics processing etc. In microwave heating the processing time is significantly shorter and therefore energy consumption is lower. Very high heating rates are also available in microwave ovens. Further, ceramics sintering with microwaves gives a unique possibility of influencing the microstructure and physical properties of the ceramic materials. Todays microwave heating technology at 915 MHz and 2.45 GHz ISM frequencies has clear costs advantages in comparison with millimeterwave heating systems (e.g. at 24.1 GHz), because the low price of magnetron microwave sources. Analysis of efficient systems for microwave heating suggests the minimization of reflections in the feeding slotted waveguide with keeping in mind the demand of uniform heating in the applicator. The shape, size and position of the slots in the waveguide walls determine the amount of the power radiating from the waveguide and the reflection coefficient, but they are also the parameters which affect the uniformity of heating. Using analytical techniques to find the equivalent impedance for the coupling slots and matching it with the impedance at the input of the waveguide to minimize reflections, is one way of optimization. In this paper narrow non-centered inclined slots in the broad waveguide wall are analyzed and the matching process for the applicator at 2.45 GHz is presented. By using FDTD simulation, the characteristics of a waveguide with this kind of slots are compared with the characteristics of a waveguide with a longitudinal shunt and a waveguide with centered inclined slots in the broad wall. Measurements of the reflection coefficients with a scalar network analyzer for the optimized slotted waveguides also have been performed.