THE MICROWAVE-DRILL THERMAL-RUNAWAY ANALYSIS

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The microwave-drill [1] employs an open-end coaxial applicator generating a localized hot-spot in the drilled material. This paper presents a theoretical analysis of the coupled thermal-electromagnetic phenomena involved, whereas the material's temperature-dependent properties (e.g. the dielectric permittivity and thermal-conductivity variations) play a dominant role in the thermal-runaway evolution. The numerical simulation employs a finite-difference time-domain (FDTD) method in a cylindrical symmetry [2]. The temporal and spatial temperature evolution profiles are simulated for mullite. The equivalent microwave-drill impedance is found as a lumped circuit with varying resistive and reactive components. This analysis is applicable for open-end coaxial microwave applicators in general.

REFERENCES

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2. U. Grosklick, V. Dikhtyar, E. Jerby, "Coupled thermal-electromagnetic model for microwave drilling", JEE'02 Proceedings, pp. 146-151, European Symposium on Numerical Methods in Electromagnetics, March 6-8, 2002, Toulouse, France.
3. For more information, see www.microwave-drill.org

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