Modeling-Based Synthesis of a Microwave Heating Process Resulting in a Uniform Temperature Field

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A fundamental problem of microwave thermal processing is the intrinsic non-uniformity of internal heating of a dielectric sample. This paper outlines an efficient technique for solving this problem with the use of numerical modeling and subsequent synthesis of the optimal process guaranteeing uniformity. The model relies on an iterative 3D FDTD solution of the coupled (electromagnetic and thermal) boundary value problem. The algorithm is implemented as a collection of MATLAB scripts producing a description of the optimal process along with the final 3D temperature field. The functionality of the proposed optimization is illustrated by a computational experiment.