A Strategy to Simulate Radio Frequency Heating Under Mixing Conditions

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Abstract

A computer simulation model was developed using finite element-based commercial software, COMSOL, to simulate temperature distributions in wheat samples packed in a rectangular plastic container and treated in a 6 kW, 27.12 MHz RF system with and without mixing conditions. The developed model was then experimentally validated by temperature distributions of three layers without mixing condition, and surface and interior temperature distributions of wheat samples under one, two and three times mixing conditions. Both simulation and experiment showed similar heating patterns in RF treated wheat samples under both conditions, in which corners and edges were overheated and the temperatures were higher in the lower sections of the container. The uniformity index (UI) was used to evaluate effects of mixing on RF heating uniformity. Both experimental and simulated UI showed decreasing trend with the increasing mixing times. The developed model can help to understand the RF heating patterns and effects of mixing conditions on RF heating uniformity and provide valuable strategy for developing effective industrial-scale RF treatments with mixing processes。

用Comsol的Joule heating 模 ，求解射 腔室 的 磁和 2 物理 ，通 瞬 求解器求解， 了解 品加 程的 拌 程，模型做了一些假 化，最 模型通 ， 到了 期效果。

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Figures used in the abstract

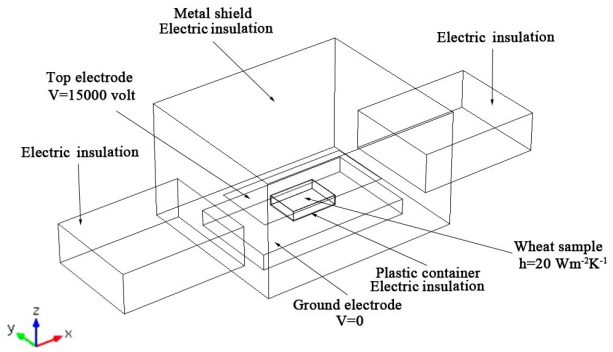

Figure 1: 射 加 系 界 件

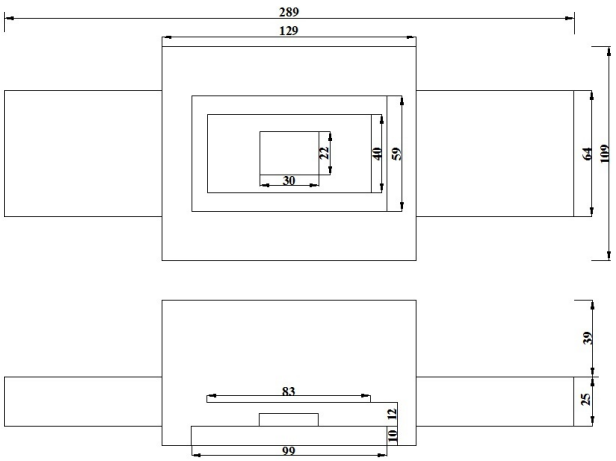

Figure 2: 射 加 系 何尺寸

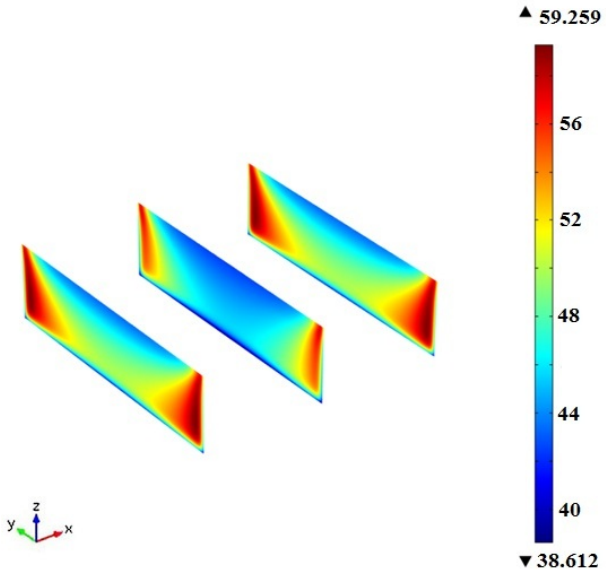

Figure 3: 加 品垂直面的 度分

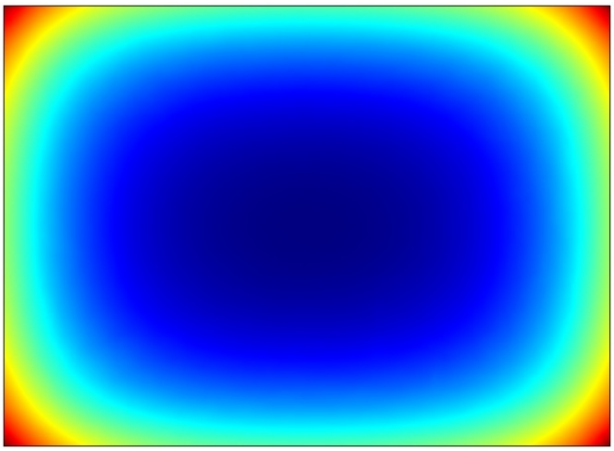

Figure 4: 品下表面的 強大小分布