

# Multiphase Porous Media Model for Microwave Drying Spherical Potatoes

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## Abstract

Mathematical description of microwave drying requires the solution of two different physics: electromagnetics in the microwave oven cavity and food material and, transport process (mass, momentum and heat transport) in the food material.

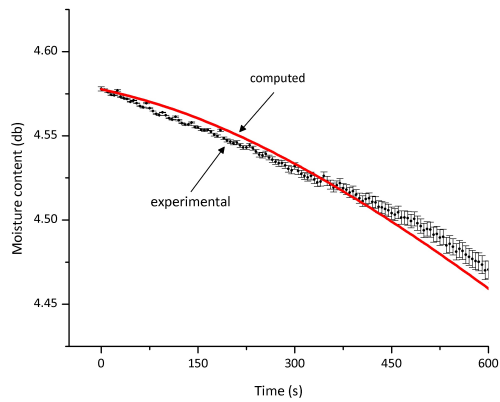
Maxwell's equations for electromagnetics were solved using the RF Module using the GMRES iterative solver with the GeometricMultigrid preconditioner. Mass, momentum and energy conservation for various species were solved using the "Transport of Dilute Species", Transport of Concentrated Species", "Darcy Law" and Heat Transfer Module, respectively, using the PARDISO direct solver.

The main objectives of the paper are:

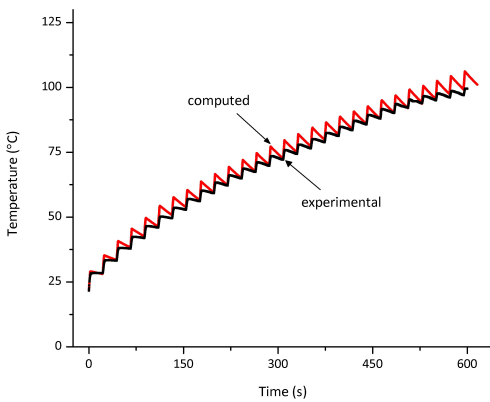
1 Develop and solve a fundamentals-based mathematical model for microwave drying process  
2 Develop an elaborate experimental system to measure point temperature histories, spatial temperature distribution, moisture loss histories and pressure development in different sized sphere samples to have a fundamental understanding of the drying process and, for model validation. The comparisons of computed and experimental moisture content, point temperature history, spatial temperature distributions and point pressure history of 6 cm diameter spherical potato are shown in Figure 1,2 and 3, respectively.

4 Use the computational model to test "what-if " scenarios during microwave drying to optimizing the drying process

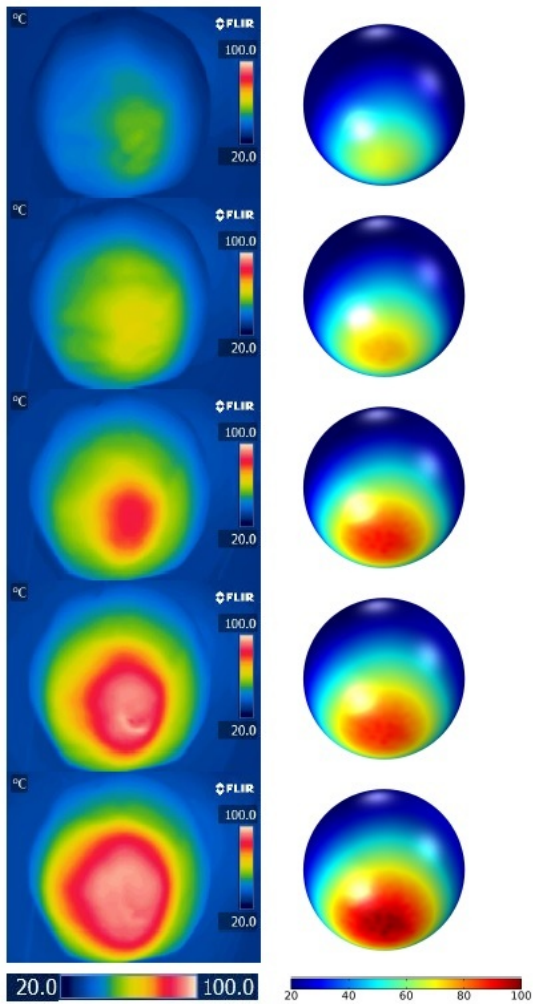
## Figures used in the abstract



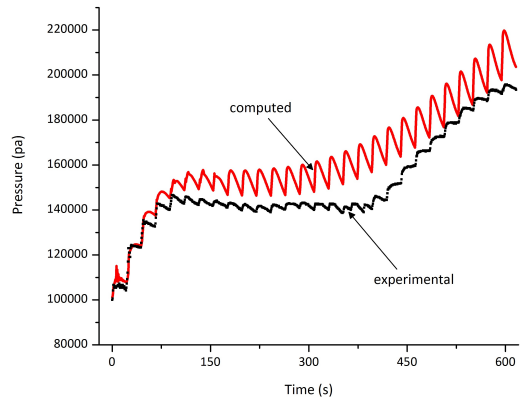
**Figure 1:** The comparisons of computed and experimental moisture content for the microwave drying process of 6 cm potato sphere.



**Figure 2:** The comparisons of computed and experimental center temperature for the microwave drying process of 6 cm potato sphere.



**Figure 3:** The comparisons of computed and experimental surface temperature distributions for the microwave drying process of 6 cm potato sphere.



**Figure 4:** The comparisons of computed and experimental center pressure history for the microwave drying process of 6 cm potato sphere.