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20.7 INVERSION OF A NUMERICAL MODEL TO ESTIMATE THE EFFECTIVE MOISTURE DIFFUSIVITY IN BAKING CAKE

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The moisture diffusivity is an important physical parameter to model food baking processes. Unfortunately specific moisture diffusivity values are not easily found in literature, especially measured or calculated during the baking processes.
The aim of this research was to estimate the effective moisture diffusivity of a cake during baking for three different oven temperature (140, 160 and 180°C). Classical *slope* method and the inversion of a specific numerical model were used. By using the inverse method, it was possible to estimate the cake moisture diffusivity as a simultaneous function of temperature and moisture content.
The research work was divided in three phases: i) experimental determination of the moisture concentration versus time during the baking process and calculation of the moisture diffusivities by using the *slope* method; ii) development of a numerical heat and mass transfer model for the determination of moisture content versus time; iii) parameter estimation of moisture diffusivity as a function of temperature and moisture content, by minimizing the distance between numerical model and experimental results using a feasible optimization algorithm.
The estimated moisture diffusivity coefficients are close to those reported in literature for similar bakery products. The experimental and calculated moisture contents were in good agreement showing a determination coefficients R^2>0.993.
The advantages of the inverse technique respect to the classical slope method, is that realistic geometries and boundary conditions can be used and that the diffusivity may be introduced as a function of a desirable property (eg. moisture content, temperature, porosity).

Proposal for poster