**Numerical modelling of heat and mass transfer in bread baking**

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Cooking food is a universal practice that can improve the taste of food, make edible foods inedible, or make them more digestible. Cereals products, especially bread, are the best example. Baking bread is a thermal process, where the product is heated at high temperature. The heat transfer causes a rise in the temperature inside the dough. The most important phenomena influencing the main variables of the process are the temperature, the concentration of the liquid water and the concentration of the water vapor in the dough. The process of baking bread is difficult to model, partly because of the fact that the simultaneous transfer of heat and mass is involved during the process.

During our work a mathematical model has been developed to describe bread baking and its temperature and moisture loss trends, it consists of a coupled PDE partial derivative equation system (heat and mass transfer). A FORTRAN program was realized to carry out our numerical tests. The work focuses on the variation of thermophysical properties of bread to know the effect of each on the conduct of heat transfer and mass during baking bread.

In order to analysis the variations of heat transfer as a function of time, we try to show the impact of the convection heat transfer coefficient HT, the density ρ and the specific heat Cp, on the evolution of the temperature since these parameters are very interesting in food applications and are among the material properties that determine the transport mechanisms inside the product. Next, we tried to show the impact of the HL convection mass transfer coefficient on liquid water and CO2 fractions.

In this study we did not study evaporation during cooking to better understand the phenomena since our model assumes that the physical properties are variable according to the porosity, the temperature and the concentration of the species. The results obtained show that HT, ρ and Cp play a role in the evolution of temperature, the cooking time is reduced with the increase in heat transfer coefficient and that the HL has a positive effect on the water loss time.

**Keywords**: Modelling, baking, heat transfer, mass transfer