Doctors of Science in Engineering

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Determination of Thermophysical Properties of Frozen Food

The book presents the results of work on the determination of thermal conductivity k, the temperature of initial freezing point T_f, apparent enthalpy H and thermal diffusivity a under laboratory conditions: an apparatus with a linear heat source for determining k by the impulse method, a DTA apparatus for determining T_f and H through a qualitative analysis of DTA curves, and an apparatus for determining a through the application of Dickerson's method. An *on-line* connection between measurement apparatuses and a computer made possible the direct monitoring of the thawing process of the sample with high temperature sensitivity (10 mK), frequency sampling rate (3,5 kHz) and statistical filtration of measured temperature and time values (tolerance ± 3*s*), and simple processing and graphic interpretation of the results. The geometry of the measurements apparatuses and the applied sample heating velocity ensured the domination of one-dimensional thermal transfer, the minimization of boundary influence and measurement sensitivity to the sample temperature distribution and the quasi-steadiness of the thawing process, which ensured the isothermal properties of the sample. The possibility of determining k, T_f, H and a through the application of the above methods and constructed mathematical models, the congruency between the experimental results and the literature on the subject and the reproducibility of the results that was achieved, all point to the success of the constructed apparatus solutions, (particularly the measurement system), and the selection of parameters that define the measurement conditions and methods.

Thermophysical properties were determined in surimi samples prepared in laboratory conditions from *Sardina pilchardus*, with the addition of NaCl (w = 1-10%), carrageenan (w = 1-10%), and a mixture of NaCl and carrageenan with a mass ratio 1:4 (w = 1-10%), as well as in the samples of chicken egg, (egg-white, yolk), mixed with NaCl (w = 1-10%).

Mentor: dr.sc. Želimir Kurtanjek, Associate Professor, Faculty of Food Technology and Biotechnology, University of Zagreb.

The thesis was defended on November 29, 1997.

Marijan Golja

Analysis of Steel Flow Stress by Elevated Temperatures and Deformation Flow of Materials in the Processes of Periodical Rolling o Seamless Steel Tubes

Stress in the state of flow and plasticity of steel at elevated temperatures is investigated. The results obtained by the hot torsion test and by the tensile test on carbon and low-alloyed structural steels for special application at the temperatures form 1073 K to 1473 K (888°C - 1200°C) are analysed and serve as a basis for the determination of parameters of steel deromation during the rolling of the hollow shell on the Pilger mill, also, the survey of the technological procedures in the production of seamless steel tubes. The mathematical model cooling and the temperature distribution inside the steel rough pierced tube after the rolling was developed and studied by the finite difference method. The real deformation flow was examined during the periodical rolling of steel tubes and useful recommendations for the process improvement were made.

Mentor: dr. sc. Ilija Mamuzić, professor, Faculty of Metalurgy, University of Zagreb.