

WORKSHOP ON MODELLING AND SIMULATION OF HIGH PRESSURE PROCESSES

Held at the Facultad de Ciencias Matemáticas of the Universidad Complutense de Madrid
22nd November 2010

BRIEF SUMMARY

by Nadia Smith (Research Group MOMAT, UCM, Spain)

- 1) Antonio Delgado: *Modelling and simulation of thermofluidodynamical aspects for adaptive control strategies of HP processes*
Balancing models are in general use for modelling and simulating High-Pressure processes. This has benefits, but there is still not enough knowledge, what makes their usage restrictive. A new proposal is to use adaptative models to simulate High-Pressure processes. This could be done by using modern hybrid models that combine several methods such as numerical and fuzzy methods, or numerical and statistical methods. There is still a lot of work to do in this field and it is a multidisciplinary task.
- 2) Kai Knoerzer: *Tools to assist the Evaluation and Optimisation of HP Thermal Processing Technology*
Tools to characterise, evaluate and improve High-Pressure Thermal Processing technology were presented. Computational Fluid Dynamics (CFD) modelling can be used and gives good results, but it needs accurate thermophysical properties and pressure profiles. The speaker pointed out that validation is essential and a wireless system that they have designed for such purposes was presented.
- 3) Konstantin Kameney: *Use of Finite Element Analysis in Designing Instrumentation for High Pressure*
Designs of the High- Pressure equipment they have developed were presented. Examples of these devices are instruments that study Inelastic Neutron Scattering, Magnetic Property Measurement Systems, High-Pressure reaction chamber. A general overview of what the center does, was given.
- 4) Round table: *Cooperation with companies*
Moderator: Pedro D. Sanz. Participants: Javier Luzarraga, Cryovac (Spain); Carole Tonello, NC Hyperbaric (Spain)
The main issue that was talked about was the lack of collaboration between companies and researchers in the High-Pressure field. The companies hinder collaboration mainly for confidentiality and economical reasons. However, they gave some ideas of how this collaboration could increase, for example with subsidies or patents. Some companies are open to let universities do experiments on their equipments. NC Hyperbaric offers their equipments for expermients to QUIMAPRES and MALTA researchers.
- 5) Jesús González: *New Diamond Anvil Cells for optical and transport measurements under high magnetic fields up to 60 T*
Small volume devices for High-Pressure (Diamond Anvil Cells) were presented. They have designed a new device, for their main motivation that is to obtain an extended experimentally achievable phase diagram for high pressures, low temperatures and a very high magnetic field.

Collaborating insitutions / sponsors:



- 6) Jordi Saldo: *Are pressure release and pressure increase rates relevant parameters on food treatment modelling?*

The literature on this topic is controversial, therefore experiments have been done to see how the decompression or compression rate could alter the results of the products treated under High-Pressure, focusing on inactivation of microorganisms. So far the conclusions are apparently incompatible with respect to the effectiveness of inactivation with High-Pressure. One of the reasons could be the lack of normalization in such experiments.

- 7) Ángel Manuel Ramos: *Modelling high pressure processes in Food Engineering*

Different mathematical models related to High-Pressure Processing were presented. With these models the temperature profile during a High-Pressure process is calculated, and then can be coupled with the enzymatic or microbial inactivation models, also presented in the talk. Some model simplifications were given (in order to optimize computational time getting similar results). Also inverse problems for parameter identification were presented.

- 8) Round table: *Challenges in the modelling and simulation of High Pressure Processes*

Moderator: Valentin García Baonza. Participants: K. Knoerzer, K. Kamenev, Á.M. Ramos. One of the most important issues that was remarked in this round table was the lack of models for small volume devices that work with High-Pressure, given that the only models for High-Pressure processing so far are all related to Food Engineering, and therefore they are on a much larger scale than the one that would be needed to model Diamond Anvil Cells. QUIMAPRES and MALTA will provide new collaborations in this field.

Collaborating institutions / sponsors:

