

Please send this report to the Secretary of the European Mechanics Council, Professor Bengt Lundberg, School of Engineering, Uppsala University, Box 534, S-751 21 Uppsala, Sweden, within one month after the Colloquium.

General

Euromech Colloquium No: 301

Title: RHEOLOGY OF COMPLEX FLUIDS / FOOD PROCESSING AND SIMILAR APPLICATIONS

Chairmen: M. LÉBOUCHE

Place and country: NANCY - FRANCE

Dates: 25 - 27 MAY 1993

Finance

The conference fee FF 1200 Including 4 meals

Funding: FF 12 000 (AUM - University Nancy I - INPL)

Accommodation (type and cost): HOTEL 250 FF each night

Meals: 4 meals included in the fees + Restaurant

Participation

Total number of participants: 55

Distribution of participants by country:

Code	Country	Number	Code	Country	Number
A	Austria	_____	IRL	Ireland	1
B	Belgium	1	LT	Latvia	_____
BG	Bulgaria	_____	LV	Lithuania	_____
CH	Switzerland	1	N	Norway	_____
CS	Czechoslovakia	_____	NL	Netherlands	_____
D	Germany	2	P	Portugal	_____
DK	Denmark	_____	PL	Poland	1
E	Spain	1	R	Rumania	_____
EE	Estonia	_____	S	Sweden	_____
F	France	41*	SF	Finland	_____
GB	Great Britain	5	YU	Yugoslavia	_____
GR	Greece	_____	CIS	CIS	(3)**
H	Hungary	_____		Others	Algeria: 1
I	Italy	1			

** After registration they didn't come (lack of money)

* 1 from Russia and 1 from Brazil, but now in a french laboratory

Is there need of another colloquium on the same subject? Which year? 1997

Scientific Report

The objective of EUROMECH 301 was a review of the situation on :

- Experimental methods for rheological characterization of complex fluids
- Experimental methods for studying of the flow patterns of these complex fluids
- Modelling and numerical simulation of flows.

Various aspects (theoretical and experimental) of momentum transfer were covered, for non newtonian fluids (shear thinning, yield, viscoelastic and thixotropic fluids), possibly containing particles. Thermal dependancy of rheological properties and their consequences over flow patterns were considered but heat transfer was excluded.

This colloquium was divided in nine sessions :

- Two of them were devoted to characterizing and modelizing of **viscoelasticity**

- * Effects of different types of structure kinetics on modelling of unsteady rheological behaviour of complex fluids

- * Flow and viscoelastic behaviour of polyasccharide systems as models for complex fluids

- * Rheological modelisation of non linear thixotropic and viscoelastic behaviour : a **BURGERS'** model generalisation

- * Viscoelastic model for foams and light emulsions

- * Non linear viscoelastic behaviour of aqueous surfactant solutions

- * Rheology of an assembly of elastic objects in contact.

- The third one was devoted to the **flow of viscoplastic fluids**

- * On the method for the investigation of viscoplastic media flow

- * Flow properties of fresh cheeses.

- * Entrance region of the yield power law fluid flowing in a circular duct

- Two others dealt with **flow of general complex fluids and study of solid particules and bubbles in flow**

- * The velocity profile of complex fluids : experimental results (via ultrasound) and their consequences for rheology and for process control, respectively

- * An experimental study of pressure drop of thermodependent pseudoplastic fluid

- * Flow patterns and heat transfer for a pseudoplastic fluid between rotating cones.

- * An experimental technique for the measurement of particle residence time in complex food fluids, applicable to UHT processes

- * Residence time distributions for solid-liquid food mixtures

- * Rheologically controlled generation of shear induced crystal structures in polymorphous fats containing multiphase systems

- * A review of literature on bubble detachment and movement in complex fluids to explain phenomena during nucleate boiling

- * A numerical study of the stress on small bodies with the chimera grid scheme approach

One obtains very interesting informations about metrology (ultrason velocimeter ; resident time measurements).

- A particular session was devoted to **gel properties**

- * Rheological properties of dispersed swellable microgelled particles

- * Viscoelastic behaviour at the sol-gel transition

- * Time scales of structure build up and destruction in thixotropics gels

of L.

- Finally, three sessions took interest in industrial applications : **Internal flow of complex fluid** (inside heat exchangers), **extrusion** and **experimental rheology**.

- * Local flow structure for non-newtonian fluids in periodically corrugated wall channels

- * Friction curves for the wavy part of the plate heat exchanger with newtonian and pseudoplastic fluids

- * The rheology of starchy materials for modelling the extrusion process

- * Interaction between processing conditions and rheological behaviour for extruded starchy products

- * Ice cream rheological properties

- * Rheology of hydrolysed whey concentrate.

- * Effects of temperature on the rheological properties of the suspensions and solutions of leaf proteins from alfalfa

These papers were of great interest for food engineering.

I believe that we obtain good equilibrium between metrology, experimental characterizing of phenomenons, modelizing and numerical simumation.

Questions and discussions were numerous and fruitfull. Trade attendance was also numerous and very active, eleven persons from companies were present.



Michel LEBOUCHÉ
Chairman of EUROMECH 301