

EUROMECH

EUROPEAN MECHANICS SOCIETY

Final Report

Please send this report to the Secretary General of EUROMECH, within one month after the Colloquium.

EUROMECH Colloquium No: 438

Title: **Constitutive Equations for Polymer Microcomposites:
On the Border of Mechanics and Chemistry**

Dates and location: **Vienna, July 15th - 17th, 2002**

Chairperson: **Dr. Ing. Al. Dorfmann, Ph.D., P.Eng.**

Co-Chairperson: **Prof. Aleksey Drozdov, Institute for Industrial Mathematics, Israel**
Prof. R.W. Ogden, Dept. of Mathematics, University of Glasgow, UK

Is there need of another Colloquium on the same or a related subject? Which year? **Yes,**
I would suggest, in the future at some time, a Colloquium focusing on the numerical aspects

Full registration fee: Euro 208 (240). Early registration Euro 178 (210).
For members (non-members) of EUROMECH Society.

What other funding was obtained? **University of Vienna (BOKU), Vienna Tourist Board**

What were the participants offered? **Coffee; lunches; EUROMECH Banquet; Registration and housing for a number of participants from Russia; book of abstracts.**

Keynote lectures by international renowned experts: **Prof. Boyce, Prof. Gent, Prof. Miehe and Prof. Wineman**

Number of members of EUROMECH (reduced registration fee):

Out of the seven participants who declared being EUROMECH member, only two were actually Members.

Number of non-members of EUROMECH (full registration fee):

30, Please note that the invited keynote lecturer and the invited participants from Russia did not pay registration fees.

Number of participants from each country:

Austria	<u> 4 </u>	Great Britain	<u> 7 </u>	Luxemburg	<u> 2 </u>
Czech Republic	<u> 1 </u>	Greece	<u> 1 </u>	Japan	<u> 1 </u>
Denmark	<u> 1 </u>	Italy	<u> 5 </u>	New Zealand	<u> 1 </u>
France	<u> 8 </u>	Russia	<u> 4 </u>	USA	<u> 12 </u>
Germany	<u> 12 </u>	Netherlands	<u> 1 </u>		

Scientific Report

The main objective of this meeting was to gather specialists in mechanical engineering and polymer science actively working on the analysis of the mechanical response of rubbery polymers and polymeric composites. Our hope was that this interaction of research scientists with different backgrounds would result in better understanding of the most challenging problems in the area of constitutive modelling and simulation and would lead to further cooperation in their study. The Colloquium was organized into a number of keynote lectures and scientific presentations.

The main areas of the Colloquium and Workshop are summarized as follows:

1. Experimental analysis of the mechanical behaviour
2. Analytical methods in the mechanics of polymers
3. Micromechanical constitutive models
4. Numerical methods and simulation
5. Time-dependent phenomena
6. Fracture and fatigue of polymeric composites
7. Anisotropy of the mechanical response
8. Ageing of rubber compounds
9. Mechanical behaviour of Nanocomposites

Keynote Lectures

Micromechanical Modelling of Particle-Modified Polymeric Materials

Mary C. Boyce

Why Do Cracks Turn Sideways?

Alan N. Gent

A Constitutive Approach to the Modelling of Hysteresis Effects in Rubber-Like Materials Based on Directly Evaluated Micro-to-Macro Transitions

Christian Miehe

Thermo-Mechanical Response of Elastomers Undergoing Scission and Cross-linking at High Temperatures

Alan Wineman

Suggestions for the future:

The concluding session was jointly chaired by Prof. Boyce from Massachusetts Institute of Technology, Prof. Ogden from the University of Glasgow and Prof. Sternstein from Rensselaer Polytechnic Institute. First, a summary of the presentations was given. From all aspects considered at this concluding session, one should be mentioned in this report. Essentially, all of them acknowledged that many models and theories have been developed over the last years, however there is no single best viscoelastic model available at this time. Furthermore, they stressed the importance and need of additional experimental work in order to validate theories. It was further agreed to encourage a greater interaction of the molecular and chemical communities in order to improve the understanding of the time depend behaviour of polymer micro-composites. Finally, a stronger interaction between the material science and the mechanical community should be supported as well.

Chairperson:



Dr. Ing. Al. Dorfmann, Ph.D., P.Eng.

January 15th, 2003