



Two-Day Workshop on Rheology of Polymer Melts

-: Organized by The Indian Society of Rheology, CoE-SPIRIT, and Venture Center :-

Learn	<ul style="list-style-type: none">• Introduction to the fundamentals of rheology with special emphasis on the rheology of polymer melts.• Special topics of direct relevance to the polymer industry• Laboratory demonstrations• Analysis and interpretation of rheological data on polymer melts
Organized by	<ul style="list-style-type: none">• Indian Society of Rheology• CoE-SPIRIT: Centre of Excellence in Polymers at CSIR-National Chemical Laboratory• Venture Center – a Technology Business Incubator
Co-sponsored by	<ul style="list-style-type: none">• TA Instruments
For whom	<ul style="list-style-type: none">• Polymers/plastics/petrochemical industry professionals in R&D, applications development, manufacturing, QC, QA functions• If seats are available, students, academics and researchers with interest in polymer rheology shall be included• Maximum 20 seats; First-come-first-serve.
When	Tuesday-Wednesday, December 16-17, 2014
Where	<ul style="list-style-type: none">• Classroom sessions: Training Room, Venture Center, NCL Innovation Park, Dr. Homi Bhabha (Pashan) Road, Pune-411008• Lab sessions: Polymers and Advanced Materials Lab, CSIR-NCL, Dr. Homi Bhabha (Pashan) Road, Pune-411008
Contact	Ms. Lipika Biswas Venture Center, 100, NCL Innovation Park, Dr. Homi Bhabha Road, Pune – 411008; Phone: +91-20-25865877 Email: eventsdesk@venturecenter.co.in
Cost	<ul style="list-style-type: none">• Medium and large companies: Rs. 15,000/-



Introduction

Rheology is an important characterization tool for the polymer/plastics industry. On the one hand, rheological properties of polymer melts and solutions are directly related to the molecular attributes of polymers such as the weight average molecular weight, molecular weight distribution, rigidity of the chain and the presence of long chain branching. On the other hand, rheological properties have direct implications on the melt processibility of polymers such as controlling the torque on extruders, ability to sustain upward film blowing, reduced necking during extrusion casting and achieving uniform thickness distribution in deep draw thermoforming. Thus, rheology can be used to link the molecular structure of polymers to their melt processing performance, and these relationships can be used to introduce new polymer grades having improved processing performance in the market.

The workshop content will be tailored to meet the interests of participants from varying educational backgrounds, who are closely associated with R&D, manufacturing, QC and applications. Specifically, researchers and R&D managers from the polymer/plastics industry, with interests in applying rheological techniques/methods to industrial processes will benefit from attending the workshop.

This workshop is meant to provide a general introduction to the fundamentals of rheology, with special emphasis on the rheology of polymer melts. Special topics, of direct relevance to the polymer/plastics industry will be covered. The workshop will comprise classroom lectures, which will cover fundamentals, data analysis methods and case studies, as well as laboratory demonstrations, which will enable participants to understand standard test protocols and get familiar with apparatus, as well as analyze rheological data from experiments on polymer melts. The workshop will also have 'group assignment' sessions in which participants will learn to interpret rheological data.

The workshop will be taught by foremost experts working on various aspects of polymer melt rheology. The Venture Center and CSIR-NCL, which will be the venue for the workshops, have excellent classrooms and rheology labs with state of the art rheometers.

Course Outline

- Introduction to rheology nomenclature and 'ideal' materials.
- Fundamentals of linear and non-linear rheology of polymer melts and solutions.
- Fundamentals of rheometry.
- Special topic: Linking polymer rheology to molecular attributes
- Special topic: Examples of linking rheology to polymer processing
- Lab sessions on rheology of polymer melts.
- Interpretation and analysis of rheological data



Schedule

Day	Topic	Time	Lectures
Day#1	Theory of Rheology	9:00 – 10:30 AM	Definitions of stress, strain Ideal fluids and solids Non-Newtonian fluids
		10:30 – 11:00 AM	Tea Break
		11:00 – 1:00 PM	Linear viscoelasticity (LVE) Non-linear viscoelasticity (NLVE)
		1:00 – 2:00 PM	Lunch break
	Rheometry	2:00 – 4:00 PM	Drag flow: controlled stress and strain rheometers Cone & plate and parallel plate geometries Capillary rheometry Extensional rheometry: uniaxial, biaxial, exponential shear, hyperbolic die, equibiaxial Instabilities (slip, fracture, inertia)
		4:00 – 4:30 PM	Tea break
	Lab session	4:30 – 6:30 PM	Steady shear with capillary and rotational rheometer Time-temperature superposition (TTS)
7:30 – 10:00 PM Dinner sponsored by TA Instruments			
Day#2	Special topics	9:00 – 10:30 AM	Rheology to macromolecular structure
		10:30 – 11:00 AM	Tea Break
		11:00 – 12:30 PM	Rheology to polymer processing
		12:30 – 1:30 PM	Lunch break
	Lab session	1:30 – 3:30 PM	Creep and stress relaxation Large-amplitude oscillatory shear (LAOS) Extensional rheology
		3:30 – 4:00 PM	Tea break
	Case studies/Data interpretation	4:00 – 6:00 PM	Case studies and data interpretation using examples of interest to polymer industry
	Course evaluation	6:00-6:30 PM	Feedback, handing out course certificates



Anchor Faculty



Dr. Ashish Lele

Chief Scientist, Polymer Sci. & Engg. Division, CSIR-NCL

Dr. Ashish Lele did a BE in Chemical Engineering from UDCT, Mumbai followed by a PhD in Chemical Engineering from University of Delaware, USA and post-doctoral research from the University of Cambridge, UK. Presently, he is Chief Scientist in the Polymer Science and Engineering Division of the CSIR-National Chemical Laboratory. Dr Lele's research interests are in rheology of complex fluids and investigating links between rheology and melt processing of polymers.



Dr. Harshawardhan Pol

Senior Scientist, Polymer Sci. & Engg. Division, CSIR-NCL

Dr. Harshawardhan Pol did an M.S. in Materials Science and Engineering from Clemson University, USA followed by a PhD in Chemical Engineering from University of Pune. He worked at The Dow Chemical Company in USA for three years before joining the Polymer Science and Engineering Division of the CSIR-National Chemical Laboratory, Pune in 2003 where he is presently a Senior Scientist. Dr. Pol is involved in research on understanding the role of macromolecular architecture on the rheology and processing of polymer melts.



Dr. Aadil Elmoumni

Product Manager-Rheology, TA Instruments, Delaware, USA

Dr. Aadil Elmoumni is a graduate of the University of Massachusetts in Amherst. He completed his doctoral thesis on flow-induced crystallization of polymers with Professor H. Henning Winter. He then took in 2005 a position as an Applications Scientist with TA Instruments-Waters LLC in the USA, where he works today as Product Manager. His tasks include management of all current rheology products and development of new instruments and accessories to satisfy the rheology market needs.

Course includes

- Course notes (hard copy) including slides, case studies, application notes
- Lab demo
- Access to restricted website with online compilation of resources
- One-on-one feedback on data interpretation exercise
- Certificate of Participation issued by Venture Center and Indian Society of Rheology
- Tea and lunch at Venture Center cafeteria
- Dinner on Day 1 sponsored by TA Instruments – Waters LLC

* Please note the participants will have to arrange for their own travel, local transport and accommodation.



About the Organizers



The Indian Society of Rheology has been created to promote closer ties between the rheology communities in Indian academia/R&D institutes and Indian industry, to assist in the development of human resources in the area of rheology within the country, to support the activities of the complex fluids community in India and to establish formal links with other Societies of Rheology across the globe.

About Venture Center

Entrepreneurship Development Center (Venture Center) – a CSIR initiative – is a Section 25 company hosted by the National Chemical Laboratory, Pune. Venture Center strives to nucleate and nurture technology and knowledge-based enterprises by leveraging the scientific and engineering competencies of the institutions in the Pune region in India. The Venture Center is a technology business incubator supported by the Department of Science & Technology's National Science & Technology Entrepreneurship Development Board (DST-NSTEDB). Venture Center's focuses on technology enterprises offering products and services exploiting scientific expertise in the areas of materials, chemicals and biological sciences & engineering.
For more information, visit <http://www.venturecenter.co.in/>

About the Sponsors



About SPIRIT at National Chemical Laboratory, Pune

SPIRIT stands for Sustainable Polymer Industry through Research, Innovation and Training. SPIRIT is a Centre of Excellence in Polymers sponsored by the Department of Chemicals and Petrochemicals, Government of India, at the CSIR-National Chemical Laboratory, Pune.
More information: <http://coespirit.in/>



About TA Instruments

TA Instruments' reputation for high technology products, quality manufacturing and unbeatable after sales support is why more customers recommend TA products to their colleagues around the world. Headquartered in New Castle, DE, USA, TA Instruments takes pride in the technical competence and professionalism that their sales force offers. TA Instruments is the world-wide leader in in thermal analysis, rheology, and microcalorimetry.

More information: <http://www.tainstruments.com/>