

# MOLECULAR VIEW FOR POLYMER RHEOLOGY

## Overview

The molecular origin of various rheological properties of material will be studied. Depending on time and temperature, homogeneous polymeric materials exhibit typical features of glass, rubber, and viscous fluid while heterogeneous polymeric systems exhibit plasticity in addition to these features. For basic understanding of the features, the molecular motion and structures at various scales are studied for polymeric systems in deformed state. Measurements are performed of rheological properties with various rheometers, of isochronal molecular orientation with flow birefringence, and of auto-correlation of the orientation with dynamic dielectric spectroscopy. Direct observation of molecular motion is also carried out with fluorescent microscopy and molecular simulations.

## Coverage of the Programme

- 1) Molecular origin(s) of stress & viscoelastic relaxation -- glassy mode & rubbery mode
- 2) Molecular expression of stress at long times (rubbery mode)
- 3) Effect of temperature (rubbery mode)
- 4) Molecular picture/model of linear viscoelastic relaxation (analysis with some aid of dielectric data)
- 5) Molecular picture/model of nonlinear viscoelastic relaxation (analysis with some aid of dielectric data)

<b>Dates for the Course</b>	<b>5<sup>th</sup> December, 2016 to 10<sup>th</sup> December, 2016</b>
<b>Host Institute</b>	<b>IISc Bangalore</b>
<b>No. of Credits</b>	<b>1</b>
<b>Maximum No. of Participants</b>	<b>50</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are an UG/PG student studying Polymer/Materials Science, Mechanical/Chemical Engineering and Applied Physics interested to know about the molecular origin(s) of stress &amp; viscoelastic relaxation in glassy &amp; rubbery mode.</li><li>▪ You are working in an industry that is interested in significant improvement in the properties of viscoelastic materials, gels, cosmetic formulations, soft condensed matter.</li><li>▪ You are a scientist in an R&amp;D laboratory that deals with research on soft materials.</li><li>▪ You are a research scholar or faculty in an academic institution interested in learning about the advances in materials processing.</li></ul>
<b>Course Registration Fee</b>	Students: Rs. 1000 Faculty and Researchers from public sector labs: Rs. 5,000

	<p>For Industry Participants: Rs. 10,000 US \$ 200 for Participants from Abroad</p>
<b>Procedure</b>	<p>Course participants need to follow these three steps:</p> <ul style="list-style-type: none"> <li>• <b>Registration at GIAN Portal:</b> <a href="http://www.gian.iitkgp.ac.in/GREGN/index">http://www.gian.iitkgp.ac.in/GREGN/index</a> which says, “Registration to the portal is a onetime affair and will be valid for lifetime of GIAN. Once registered in the portal, an applicant will be able to apply for any number of GIAN courses as and when necessary. One time Non-refundable fee of Rs. 500/- is to be charged for this service.”</li> <li>• <b>Registration for the course</b> by sending an e-mail to <a href="mailto:gian.iiscmaterials@gmail.com">gian.iiscmaterials@gmail.com</a> with the following details: <ol style="list-style-type: none"> <li>1. Full name</li> <li>2. Status (UG/PG Student, or Designation at your organization)</li> <li>3. Institution</li> <li>4. Department</li> <li>5. Full postal address</li> </ol> </li> <li>• <b>Mode of payment: Cheque drawn in favour of “Registrar, Indian Institute of Science” payable at Bangalore.</b> Please mail your cheque to the GIAN Secretariat.</li> </ul>
<b>Accommodation</b>	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis.</p>



### **Prof. Hiroshi Watanabe**

Prof. Hiroshi Watanabe is a Professor at Institute for Chemical Research, Kyoto University, Japan. His research interests are Rheology, Dynamics, and Structures of Homopolymers, Block Copolymers, Suspensions, Emulsions, Gels, and Related Aggregating Systems. He is amongst the top 40 most prolific *Macromolecules* authors. He is currently the associate editor of *Macromolecules*.

#### **Course Coordinator**

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