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Professor

Program: Advanced Materials Science and Technology

Area: Advanced Mechanical Science and Engineering

Undergraduate: Dept. of Mechanical and Production Eng.

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Professional Expertise

His professional expertise is related to Non-Newtonian fluid mechanics and rheology, in particular, experimental analysis of flow behavior of complex fluids, e.g. polymer solutions, suspensions, liquid crystalline polymers and so on. Moreover, he and his group have focused on flow control with functional fluids, electro-rheological effects of liquid crystals and those applicability to the micro mechanical devices. They have been also interested in micro flow of the polymer solutions, where the channel size is almost same as the polymer size and deformation process of the molecules are affected with the micro gap.

Research Fields of Interest

Flow behavior of complex fluids

- Transient response of concentrated suspensions after flow reversal
- Flow properties of polymer solutions in micro-slot-channels with abrupt contraction
- Influence of flow conditions for the structure and electrical properties of carbon nanotube dispersion
- Printing characteristics of pastes in screen printing and gravure printing
- Flow-induced structure change of aqueous polymer solution in abrupt contraction channels

Functional fluids

- Electro-rheology of nematic liquid crystal and its application to micro mechanical devices
- Yield stress control of smectic liquid crystal with current type of electric fields applied

Micro fluidics

- Structural relaxation process of DNA polymer in micro channel
- Influence of channel geometry on vortex generated in micro planer contraction flows of polymer solution
- Mixing process with unstable flow of polymer solution in micro channels

Bio-rheology

- Correlation between mechanical properties and proliferation of cultured single oral mucosa keratinocyte cells
- Flow properties of gel-sol mixture related to food rheology

Education

1992: Doctor of Engineering, Tokyo Institute of Technology, Japan

1980: M.S. in Engineering, Graduate School, Niigata University, Japan

1978: B.S. in Engineering, Dept. of Mechanical Engineering, Niigata University, Japan

Professional Societies and Activities

1. The Japan Society of Mechanical Engineers
2. The Society of Rheology, Japan
3. The Japan Society of Fluid Mechanics
4. Japanese Liquid Crystal Society

Awards

1. The SRJ Award, 2010, The Society of Rheology, Japan
2. The SRJ Research Award, 1998, The Society of Rheology, Japan

Major Publications

Papers

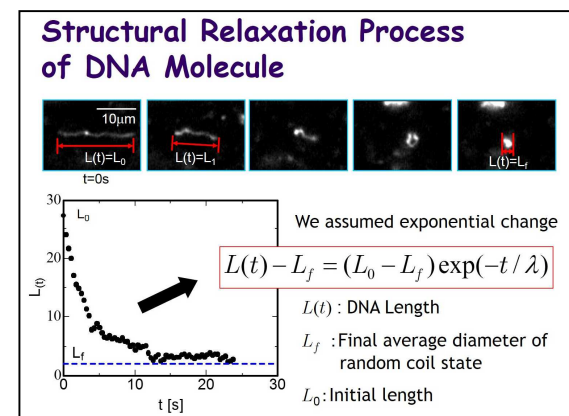
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- [2] "Transient Response of Viscoelastic Concentrated Suspensions After Reversal in Large Amplitude Oscillatory Shear Flow", *Nihon Reoroji Gakkaishi (J. Soc. Rheol., Japan)*, 39-4, pp.173-180, 2011.
- [3] "Influence of Channel Size on Deformation Behavior of DNA Polymers in Micro Flows", *5th Pacific Rim Conference on Rheology*, Paper No.A-5-1, pp.1-2, 2010.
- [4] "Huge Reduction in Pressure Drops of Water, Glycerol/Water Mixture, and Aqueous Solution of Polyethylene Oxide in High Speed Flows through Micro-Orifices", *Physics of Fluids*, 21, 052002, pp.1-9, 2009.
- [5] "Flow Induced Unstable Structure of Liquid Crystalline Polymer Solution in L-Shaped Slit Channels", *ASME, Journal of Fluid Engineering*, 130, 081503, pp.1-6, 2008.
- [6] "Drag Reduction in the Flow of Aqueous Solutions of Detergent through Mesh Screens", *Nihon Reoroji Gakkaishi (J. Soc. Rheol., Japan)*, 36-3, pp.125-131, 2008.
- [7] "Solid-like Properties of Liquid Crystal in Smectic Phase Controlled with Electric Field Applied", *15th Int. Congress on Rheology (ICR2008)*, pp.484-486, 2008.
- [8] "Electro-Rheological Properties of Liquid Crystal in High Shear Rate Region", *Nihon Reoroji Gakkaishi (J. Soc. Rheol., Japan)*, 35-2, pp.85-91, 2007.
- [9] "Measurement of Dynamic Surface Tension of Surfactant Solutions", *Nihon Reoroji Gakkaishi (J. Soc. Rheol., Japan)*, 35-5, pp.265-271, 2007.
- [10] "Flow Behavior of Hershel-Bulkley Fluid in a Slot Die", *Nihon Reoroji Gakkaishi (J. Soc. Rheol., Japan)*, 34-4, pp.213-222, 2006.
- [11] "Study of Structural Rearrangement of Liquid Crystalline Polymer Solution in a Transient Couette Flow with a Flow Direction Change", *Nihon Reoroji Gakkaishi (J. Soc. Rheol., Japan)*, 34-1, pp.9-15, 2006.
- [12] "Micro-Flow Control and Micropump by Applying Electric Field through a Porous Membrane", *JSME International Journal, Series B*, 47-3, pp.557-563, 2004.
- [13] "Response of Concentrated Suspensions under Large Amplitude Oscillatory Shear Flow", *Journal of Rheology*, 49-1, pp.71-85, 2005.
- [14] "Solid-like Behavior of Concentrated Particulate

Suspensions under Squeezing Flow", *Nihon Reoroji Gakkaishi (J. Soc. of Rheol., Japan)*, 33-1, pp.29-36, 2005.

[15] "Electro-Rheological Response of Liquid Crystals under Oscillatory Squeeze Flow", *JSME International Journal, B*, 48-3, pp.524-531, 2005.

[16] "Transient response of concentrated suspensions after shear reversal", *J. Rheology*, 46-1, pp.295-305, 2002.

[17] "Converging and Diverging Flow of Electrorheological Fluid in Minute Channels", *International Journal of Modern Physics B*, Vol. 15, Nos. 6 & 7, pp.723-730, 2001.



Structural relaxation process of DNA polymer affected with gap size in a micro channel



Typical optical pattern observed in shear flow of smectic liquid crystal