Other - Enabling Process Innovation through Computation (EPIC) Seminar Series

Advances in Large-Amplitude Oscillatory Shear Flow

A. Jeffrey Giacomin

Queen's University, Kingston, Canada

Digital Media Center 1034
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Abstract:

In 1935, Andrew Gemant conceived of the complex viscosity, a rheological material function measured by "jiggling" an elastic liquid in oscillatory shear [*Rheol. Acta*, **51**, 481 (2012)]. This test reveals information about both the viscous and elastic properties of the liquid, and about how these properties depend on frequency. The test gained popularity with chemists when John Ferry perfected instruments for measuring both the real and imaginary parts of the complex viscosity [*Mem. Trib., NAE*, **17**, 96 (2013)]. In 1958, Cox and Merz discovered that the steady shear viscosity curve was easily deduced from the magnitude of the complex viscosity, and today oscillatory shear is the single most popular rheological property measurement. With oscillatory shear, we can control two things: the frequency (Deborah number) and the shear rate amplitude (Weissenberg number). When the Weissenberg number is large, the elastic liquids respond with a shear stress over a series of odd-multiples of the test frequency. In this lecture we will explore recent attempts to deepen our understand of the physics of these higher harmonics, including especially harmonics higher than the third.

Speaker's Bio:

Dr. Giacomin is Professor of Chemical Engineering and of Mechanical and Materials Engineering at Queen's University at Kingston in Canada where he holds the title of Tier 1 Canada Research Chair in Rheology. Born in Kingston, Professor Giacomin graduated high school on the island of Montreal. He earned his bachelor's and master's degrees in Chemical Engineering from Queen's University in Kingston, before joining the Research Division at DuPont Canada. He then earned a PhD in Chemical Engineering from McGill University under Professor John Dealy, his thesis titled "A Sliding Plate Melt Rheometer Incorporating a Shear Stress Transducer." He joined the Mechanical Engineering faculty at Texas A&M University. He has been Professor of Mechanical Engineering at the University of Wisconsin, where for twenty years he chaired its Rheology Research Center. He has held visiting professorships at McGill University, the University of Sherbrooke, the Swiss Federal Institute of Technology, the Paris School of Mines, the National University of Singapore, Chung Yuan University near Taipei, Yunlin University, in southern Taiwan, and Shandong University in mainland China. He married Marie, and they have a son David, and daughter, Caroline. Both children study engineering. He speaks English, French and some Mandarin Chinese. His hobbies: Chinese characters, expert witnessing for products liability and patent litigation, and his passions are cycling and ice hockey. He is a former President of The Society of Rheology, a friendly association of some 1,600 rheologists. Giacomin also serves as Editor-in-Chief of *Physics of Fluids*.

Center for Computation & Technology
2003 Digital Media Center • Telephone: +1 225/578-5890 • Fax: +1 225/578-8957