

Viscoelastic Effects in Elastomers and Impact on Durability

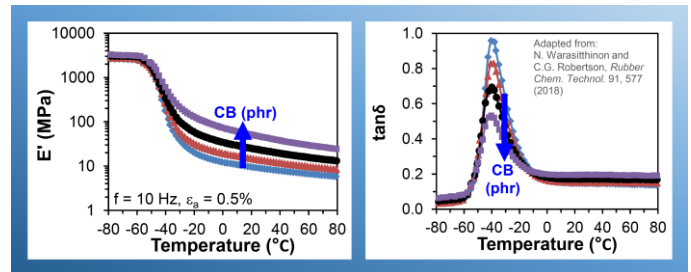
Do you want to better understand the dynamic mechanical data generated by your rubber lab? This half-day course will clarify the reasons for the various temperature, frequency, and strain sweeps that are used in dynamic testing of elastomers (especially filled rubber) and discuss the impact of the viscoelastic behavior on heat build-up and durability of rubber products. This specialized training will benefit materials engineers, compounders, rubber chemists, product development engineers, R&D scientists, and rubber lab managers at manufacturers of tires and rubber parts and companies that supply raw materials. This is a stand-alone course, although it is recommended to take this training as a supplement to the adjacent 1.5-day *Rubber Compounding for Durability* course.

Course Objectives

- Know the key viscoelastic signatures of rubber and how to characterize with testing
- Learn about self-heating (heat build-up) in elastomers
- Understand how strength and fatigue lifetime are affected by viscoelastic dissipation (hysteresis) and temperature

Instructor

Dr. Chris Robertson is an international authority on polymer science, viscoelasticity / rheology, and rubber compounding for performance. He brings over 15 years of materials research and product development experience at tire and rubber companies and raw materials suppliers. Chris is co-inventor of 32 patents, co-author of 55 publications in peer-reviewed journals, and serves as Associate Editor of *Rubber Chemistry & Technology*.



Format

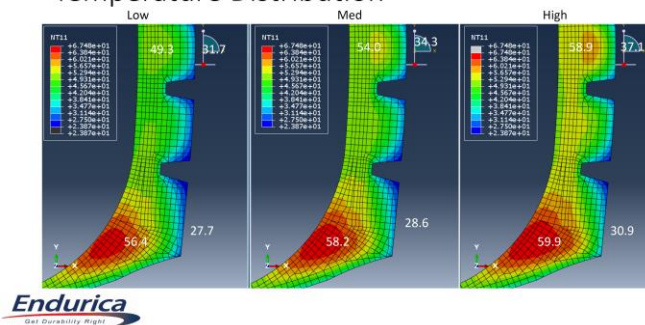
This half-day course includes lectures and classroom exercises focused on understanding viscoelasticity and its impact on strength and fatigue of rubber materials. Snacks are included. Lunch is included for participants also taking *Rubber Compounding for Durability* course.

Agenda

Day 1: 1:00 pm – 4:30 pm

- Overview of viscoelasticity and dynamic mechanical analysis (DMA)
- Key viscoelastic signatures of elastomers and how to effectively characterize with dynamic testing
 - Glass-to-rubber softening transition
 - Payne effect
 - Mullins effect
- Viscoelastic self-heating (heat build-up) and blow-out
- Predicting temperature rises in rubber applications from energy dissipation/hysteresis
- Effects of hysteresis and temperature on elastomer durability

Temperature Distribution



W. V. Mars, J. D. Suter, and C. G. Robertson, "Tire Rolling Resistance and Heat Build Up Calculations with Endurica's Microkinematic Kraus Model", presented at 195th Technical Meeting of the Rubber Division, ACS, Independence, OH, April 30-May 2, 2019.



Registration Form: *Viscoelastic Effects in Elastomers and Impact on Durability*

Course Date: February 5, 2020

Course Location: MicroTek Training Center
1000 Abernathy Rd NE
Bldg. 400, Suite 194
Atlanta, GA 30328

Price: \$568 * (Discount price of \$368 if purchased with *Rubber Compounding for Durability* course – contact Joe Suter at email address below for Promo Code)

*for registrations received 14 days prior to course date. Registration after this date incurs a late fee of \$250.

To **Register ONLINE**, go to www.endurica.com/training/#viscoelastic.

OR you can mail, fax or e-mail this form to:

Attention: Joe Suter

jasuter@endurica.com

Fax: 567-429-7034

Phone: 419-957-0543 x707

Endurica LLC

1219 West Main Cross, Suite 201

Findlay, Ohio 45840

Name _____

Company Name _____

Street Address _____

City _____ State _____ Zip _____

Work Phone _____

Email _____

Any food or other preferences (vegetarian?) _____

Payment Method:

PO No. _____ Credit Card Type: VISA MasterCard

Card No. _____ Card CVV No. _____

Cardholder Name _____ Exp. Date _____

Card Billing Street Address _____

Card Billing ZIP Code _____

Signature: _____ Date _____

Or, write a check payable to Endurica LLC.

Endurica LLC reserves the right to cancel a scheduled training course if the minimum class size is not met. In the event of a cancellation, Endurica LLC will make every attempt to notify registered participants within five working days. Payment made for a canceled course will be refunded in full or applied to another scheduled training course.

Participant cancellations must be received at least 10 working days in advance. Registrations canceled by participants less than 10 working days before the training course begins are subject to a 50% cancellation charge. For cancellations occurring on the first day of a scheduled training course, and for "no shows," the full tuition fee is non-refundable.

Endurica LLC • www.endurica.com
1219 West Main Cross, Suite 201 • Findlay • Ohio • 45840 • USA
P: (+1) 419-957-0543 • E: info@endurica.com