

Abstract Submitted
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A New Aspect to Nano-Composite Rheology – the Localized Memory Effect XIAORONG WANG, Bridgestone Americas, Center for Research and Technology, 1200 Firestone Parkway, Akron, OH 44317, CHRISTOPHER ROBERTSON — We discovered that particle-reinforced elastomers after being sheared (or aged) in oscillation at a frequency f_a at a small strain γ_a (e.g., $\sim 1\%$ strain) for time t_a can often produce a spectrum hole or drop in their dissipation spectra. The location of the hole depends on the aging strain amplitude γ_a . The depth of this hole is influenced by both the oscillatory aging frequency f_a and the aging duration t_a , and follows a simple power relationship of the product of f_a and t_a . Sequential shear at two strains reveals that when $\gamma_{a1} > \gamma_{a2}$ the resulting dynamic spectra appear to be a combination of that aged at γ_{a1} and γ_{a2} ; whereas for $\gamma_{a1} < \gamma_{a2}$, the resulting dynamic spectra only reflect the characteristic hole burning of the second strain after holding at γ_{a2} . This new memory effect occurs at very small strains and involves material stiffening during the strain aging, and both of those features are quite different from the Mullins effect in filled elastomers. Also, this new memory is found to last for more than 10 days without noticeable sign of disappearing.

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