Abstract Submitted
for the OSF06 Meeting of
The American Physical Society

Ultrasound Treatment of Polyisoprene Rubber, Studied by NMR Relaxation and Diffusion.[1] E. VON MEERWALL, X.M. SUN, T. JOSHI, A.I. ISAYEV, Univ. Akron — In support of rubber recycling, we have studied the effect of intense ultrasound on unfilled cis-polyisoprene (PI) melts and networks using proton NMR T2 relaxation and pulsed-gradient diffusion. At 70.5 deg.C the echo decays show two components, due to entangled sol and crosslinked network; and unentangled sol, dangling ends, and oligomers. Component T2 values, hence intermolecular mobilities, increase with sonication, with modest changes in relative amplitudes. The high melt molecular weight(M) without a low-M tail precluded diffusion measurements. We then examined PI melts degraded by ultrasound with and without subsequent vulcanization. Here the T2 decays are consistent with three components. Sonication shifts and broadens the M-distribution but produces no network. Curing generates at least 94% network, lowers all mobilities, and decreases the proportions of unentangled sol and of oligomers. The diffusion spectrum is bimodal, arising from intermediate fractions and oligomeric species. Both diffusion rates and all T2 values increase slightly with ultrasound amplitude. We compare these results with our earlier work in natural rubber.

[1]Supported in part by NSF DMI 00 84740 and Ohio Board of Regents

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Date submitted: 14 Sep 2006 Electronic form version 1.4