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Ultrasound Devulcanization of Natural Rubber, Studied by NMR Relaxation and Diffusion[1] E. VON MEERWALL, J.L. MASSEY, C.-K. HONG, A.I. ISAYEV, University of Akron — In support of recycling of industrial rubbers, we have studied the effect of intense ultrasound on unfilled natural rubber networks using proton and carbon transverse NMR relaxation and diffusion, sol extraction, and bulk characterization. At 70.5° C the proton echo decay exhibits three components, due to entangled sol and crosslinked network; unentangled polymeric sol plus dangling chain ends; and oligomer remnants. Contrary to the 13C results which indicate backbone mobilities decreasing with sonication (hence with increasing sol fraction), all 1H component T2 values, hence intermolecular mobilities, increase by similar modest factors; the network component amplitude decreases strongly. Diffusion of unentangled sol is sharply bimodal, arising from intermediate fractions and unreactive oligomers. Both diffusion rates decrease slightly with sonication in spite of plasticization by sol, because degradation adds sol primarily of intermediate molecular weights. We compare these results with our earlier work in SBR. Although ultrasound devulcanization does not recover many properties of the virgin melt, recyclability is not compromised.

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