ULTRASOUND DEVULCANIZATION OF SBR: MOLECULAR MOBILITY OF GEL AND SOL

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ABSTRACT

In an effort to support the recycling of rubbery polymers and composites, ^{1}H NMR relaxation and pulsed-gradient spin echo diffusion measurements have been performed on virgin and unfilled vulcanized strene–butadiene rubber (SBR), and networks after various extents of devulcanization using an ultrasound technique. The NMR methods recognize unentangled light molecules (*e.g.* sol), but do not distinguish between unattached entangled large molecules and chemical network segments. Devulcanization generates additional sol with a wide mass distribution, thus increasing both sol and gel mobility, but decreasing sol mean diffusivity. The latter effect is accounted for by the increasing mean sol molecular mass but also by the increasing glass transition temperature, which is related to main-chain stiffening seen in our earlier ^{13}C NMR experiments. In addition to improving the molecular-level understanding of devulcanization, this study provides guidance for the optimization of the devulcanization parameters.