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Deuterium NMR studies of segment orientation in PDMS unimodal and bimodal endlinked networks.[1] CLAUDE COHEN, GEOFFREY GENESKY, T. MICHAEL DUNCAN, Cornell University — Polymer segment orientation in elastomers is revealed by solid state deuterium NMR spectra: earlier work has focused on the frequency split between the peaks of the spectra from stretched elastomers rather than the details of the lineshape. The split has classically been interpreted as a measure of polymer segment order parameter S caused by excluded volume interactions between neighboring segments. We synthesized deuterated PDMS chains of about 5000 g/mol and 80,000 g/mol to probe the segmental orientation of each component separately in bimodal networks. Even in the unstretched state, the spectra for the labeled short chain networks show an evolving lineshape with varying short chain content. We compute the average absolute value of the frequency shift of the entire spectrum to better account for the highly aligned segments. This method allows us to probe the chain segment alignment with increasing strain in both unimodal and bimodal networks and confirms Monte Carlo simulation results.

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