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Elastic properties, reaction kinetics, and structural relaxation of an epoxy resin polymer during cure MANON HEILI, ANDREW BIELAWSKI, JOHN KIEFFER , Univ of Michigan - Ann Arbor — The cure kinetics of a DGEBA/DETA epoxy is investigated using concurrent Raman and Brillouin light scattering. Raman scattering allows us to monitor the *in-situ* reaction and quantitatively assess the degree of cure. Brillouin scattering yields the elastic properties of the system, providing a measure of network connectivity. We show that the adiabatic modulus evolves non-uniquely as a function of cure degree, depending on the cure temperature and the molar ratio of the epoxy. Two mechanisms contribute to the increase in the elastic modulus of the material during curing. First, there is the formation of covalent bonds in the network during the curing process. Second, following bond formation, the epoxy undergoes structural relaxation toward an optimally packed network configuration, enhancing non-bonded interactions. We investigate to what extent the non-bonded interaction contribution to structural rigidity in cross-linked polymers is reversible, and to what extent it corresponds to the difference between adiabatic and isothermal moduli obtained from static tensile, i.e. the so-called relaxational modulus. To this end, we simultaneously measure the adiabatic and isothermal elastic moduli as a function of applied strain and deformation rate.

Manon Heili
Univ of Michigan - Ann Arbor

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