

## Physics of polymer networks

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The elasticity of crosslinked polymer networks is almost entirely entropic in origin, making many soft materials have modulus that increases with temperature. Simple models of rubber elasticity conclude that the modulus is of order  $kT$  per elastic strand. However, the measured network modulus is usually larger, because of a strong contribution from entanglements trapped during crosslinking. Entanglements raise the modulus above  $kT$  per strand and also act to restrict swelling of the network when immersed in solvent. Interestingly, the simple models that ignore entanglements lead to the observed relations between modulus and equilibrium swelling.