

Shear modulus in a gel depends on osmolarity

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ABSTRACT: The purpose of this study is to quantify the shear modulus of a gel at constant strain and changing external salt concentration. Sodium methacrylate (NaMa) is dissolved into hydroxy-ethyl-methacrylate (HEMA). Demi water and polyethylene glycol dimethyl ether (DMPEG) is added. The mixture is UV-polymerised to discs of 100 mm diameter and 2 mm height. The sample is placed within a tightly fitting ring, between two porous platens, into a chamber filled with NaCl-solution at constant temperature.

The axial strain - measured by means of a separate extensometer - is modified in stepwise fashion. At each strain equilibration of the hydrogel with the external bath solution is achieved. During the equilibration, the extensometer steers the motor of the draw bench to keep the axial strain constant. In each equilibrium state, a sinusoidally varying torsional shear strain is applied the gel. The shear modulus is calculated from the ratio of the amplitude of the measured torque over the applied torsional angle. The shear modulus is found to increase with decreasing concentration, indicating that a chemical stress is present in the gel.