GELATION OF BIO-POLYELECTROLYTES: INTERPLAY BETWEEN BACKBONE HYDROPHOBICITY, COUNTERIONS SPECIFICITY AND COUNTERIONS VALENCE

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We study the rheological properties of carboxymethyl cellulose with counter-ions of different valences and binding constants. Increasing the counterion valence or its binding constant to the polymer backbone promotes inter-chain associations, which lead, above the entanglement concentration, to an increase in the solution viscosity and plateau modulus. At sufficiently high polymer concentrations, these interactions become sufficiently strong to cause the formation of weak gels.

A different approach to promote inter-chain associations (and thereby gelation) is to increase the hydrophobicity of the polymer backbone. This is achieved by varying the average fraction of carboxymethyl groups substituted in each cellulose unit, also known as the degree of substitution.

Combining these two approaches allows us to design the flow properties of carboxymethyl cellulose solutions and gels as well as to tune their response to changes in environmental conditions such as ionic strength, pH, or solvent composition.