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STRUCTURE AND MECHANICAL PROPERTIES OF NETWORKS OF A STIFF POLYELECTROLYTE

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The paper is devoted to the study of networks based on stiff-chain polysaccharide xanthan. Unperturbed structure of these systems was visualized by freeze-fracture transmission electron microscopy. It was shown that in xanthan solutions without cross-linker, a side-by-side association of xanthan double helices occurs at polymer concentrations close to the transition from semi-entangled to entangled regime. At higher polymer concentrations, aggregated macromolecules were shown to form a rather dense skeleton typical for phase-separated structures. One can suggest that the formation of the network of percolated polymer-rich domains occupying the whole volume of the system permits to get an optimum arrangement of stiff-chains with respect to each other without restriction of the motion of free ions.

The cross-linking by chromium induces additional aggregation between macromolecules enhancing the microphase separation. The increase of the cross-linking density leads to the thickening of the polymer skeleton and simultaneous decrease of the network mesh size, which results in the enhancement of the mechanical properties.

It was demonstrated that the mechanical properties of the networks can be significantly modified by surfactant addition. Responsive structure of surfactant aggregates allows easy altering of the mechanical properties of the polymer-surfactant networks thus providing a tool to get polymer matrix with desirable characteristics for a given application.

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