By using static light-scattering we have studied the binary (polymer–solvent) and ternary (polymer1–polymer2–solvent) solutions of a number of individual biopolymers whose structure in aqueous medium are strongly different and well known. These include dextrans, pectinate, alginate, carboxymethyl cellulose, 11S globulin, ovalbumin and fibrinogen. Molecular weight and size of the biopolymers were obtained in the binary solutions. Second virial coefficients characterizing the nature and intensity of the pair interactions polymer–polymer and polymer–solvent were calculated from light scattering data. The correspondence between the character of biopolymer interactions and the phase state of the mixture solutions at moderate concentration was observed. The relationship between the conformations of the biopolymers and the character of their interactions was determined. The coordinates of the critical points of the phase separation in systems were calculated. Systematic correlations of the difference of the affinity biopolymers to the aqueous medium with the intensity of the polymer1–polymer2 interactions and the biopolymer's concentration at the critical point were carried out.

THE INFLUENCE OF BIOPOLYMERS ON EMULSION STABILITY

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The correlation between the phase behaviour of aqueous solutions of caseinate + guar gum and the stability of oil-in-water emulsions stabilized by caseinate and containing guar gum has been investigated in the presence and absence of added salt at pH 6·7. The aqueous phase behaviour of sodium caseinate + dextran T40, T500 or T2000, in the presence and absence of added salt, was also investigated as a comparative model system.

The water–caseinate–guar system displayed visible phase separation in 0·2 M NaCl at 20°C and pH 6·7. The system maintained homogeneity in the absence of added salt. Tubidity measurements supported the observed phase behaviour and provided evidence for phase separation in the presence of salt.

Oil-in-water emulsions prepared with 10 wt% oil and 2 wt% caseinate displayed extensive creaming. A self-depletion mechanism is proposed. The presence of unadsorbed guar gum (0·001–0·2 wt%) in 10 wt% oil emulsions prepared with 1 wt% caseinate gave rise to enhanced creaming and serum separation due to depletion flocculation. Relative rates and extents of emulsion creaming were determined over a 50-day period at 5°C. The effects of ionic strength on creaming and flocculation were investigated.

In the absence of aqueous phase separation, emulsion stability was reduced with respect to creaming and flocculation by the mechanism of depletion. The concentration of guar gum required to destabilize the emulsion was much lower than that required to cause thermodynamic phase separation in the absence of oil at the same ionic strength and caseinate concentration. Relationships between aqueous phase behaviour and emulsion stability are discussed with a view to developing a predictive model to enable future biopolymer selection to be made on the basis of rheological and emulsion destabilization properties.

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PROTEIN–POLYSACCHARIDE INTERACTIONS AT THE OIL/WATER INTERFACE

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Electrophoretic mobilities of emulsion droplets of di-*n*-butyl phthalate formed in the presence of methemoglobin alone, methemoglobin plus alginate or carboxymethyl cellulose have been measured. At pHs below the protein isoelectric points addition of the polysaccharide conferred a net negative charge on the emulsion droplets. For pHs up to approximately 2 units above the isoelectric point the mobilities of the polysaccharide containing emulsion droplets were substantially more negative than for the protein covered droplets. At higher pHs the observed mobilities were similar for both systems. Measurements of alginate surface loadings confirmed that polysaccharide was located at the surface of the oil droplets stabilised with methemoglobin at pHs above the protein isoelectric point. The surface concentration of alginate was approximately 2 mg/m^2, independent of pH in the region pH 5·0–8·0 (Ward-Smith *et al.*, 1994).

Creep measurements were done on hemoglobin, hemoglobin–alginate and hemoglobin–CMC emulsions at 3 pHs and oil volume fractions up to 60%. The instantaneous elastic compliance, due to deformation within a floc, decreased with increasing oil concentration, and provides a useful method of studying how flocculated a system actually is. The point at which the oil volume fraction is large enough to cause bridging flocculation can be easily determined.

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EFFECT OF THE HYDROCARBON–DECANE AND FATTY ACID SALT–SODIUM DECANOATE ON THE THERMODYNAMIC PROPERTIES OF THE PROTEINS IN THE AQUEOUS MEDIUM

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Proteins, polysaccharides and lipids are the main components of real foods. It is well known that the mechanisms of food