pH- and salts-effects on formation of interpolymer complexes via hydrogen bonding in aqueous solutions

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Complex formation of synthetic poly(carboxylic acids) and proton-acceptor non-ionic polymers via hydrogen bonding has been the focus of intensive fundamental and applied research during the past decades.

In the present communication we report about the effect of pH and ionic strength on the formation of colloidal dispersions of interpolymer complexes based on poly(acrylic acid) (PAA) and a number of different non-ionic polymers. The following non-ionic polymers were used in the present work: polyvinylpyrrolidone, polyacrylamide, polyethylene oxide, polyvinyl methyl ether, polyvinyl alcohol, poly-N-isopropylacrylamide, poly-2-hydroxyethyl vinyl ether, hydroxyethylcellulose and hydroxypropylcellulose.

The critical pH values of complexation (pH_{crit}) were determined for aqueous mixtures of PAA with each non-ionic polymer. It was found that pH_{crit} values strongly depend on the nature of non-ionic polymer and can be used for evaluation of complex formation ability of polymers. The higher values of pH_{crit} are typical for stronger complexing polymers. An addition of inorganic salts can influence the pH_{crit} significantly and this effect is greatly dependent on the nature of non-ionic polymer. Polymeric complexes were classified on two groups depending the effect of ionic strength on pH_{crit}. The first group is weakly complexing polymers, which critical pH is increased upon addition of inorganic salts into solution. The second group is strongly complexing polymers and their critical pH is lowered in the presence of inorganic salts. The nature of inorganic salts effects is discussed in terms of hydrogen bonding and hydrophobic interactions.