

Thermodynamic parameters of some multicomponent intermacromolecular complexes in relation to their structure and composition

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SUMMARY

Four component intermacromolecular complexes involving methacrylic acid-acrylamide copolymer, poly(ethylene imine), poly(vinyl pyrrolidone), and poly(methacrylic acid) were prepared. The stability constants and related thermodynamic parameters (e.g. ΔH° and ΔS°) of these complexes were determined at several temperatures. The enthalpy and entropy changes of the systems with temperature have been interpreted in terms of destabilization of the various interacting forces involved in complex formation.

INTRODUCTION

Studies on intermacromolecular complex formation between different macromolecules with complementary binding sites, is an important field in Polymer Science, particularly in view of their potential applications in various industries (1,2). Though, considerable amount of work have been reported in the literature regarding the fundamental studies on polymer-polymer interactions, and applications of intermacromolecular complexes, but detailed thermodynamic studies on these systems are particularly lacking. Keeping this object in mind, we have studied the interaction of a typical acrylic copolymer, e.g. methacrylic acid-acrylamide (MA-AAm) with poly(ethylene imine) (PEI), poly(vinyl pyrrolidone) (PVP) and poly(methacrylic acid) (PMA). Since, both the comonomer units of the copolymer (e.g. MA and AAm) are known to form complexes with each of the above mentioned component polymers (1,2), therefore, by adding varying amounts of component polymers to the acrylic copolymer, one could obtain several multicomponent complexes. The stability constant (K) and related thermodynamic parameters (e.g. ΔH° and ΔS°) of these complexes, will depend on the relative proportion of the various reacting units present in the complexes. In this report, an attempt has been made to correlate the relative enthalpy and entropy changes of the complexes at various temperatures with the possible weakening of different interacting forces between the reacting units of the complexes.

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