

A comparative study of thermodynamic parameters of interpolymer complexes of an acrylic copolymer and a polymer blend with a polyelectrolyte

S. K. Chatterjee*, Shalini Nigam, Vandana Kapoor

Department of Chemistry, University of Delhi, Delhi-110007, India

Received: 21 October 1994/Revised version: 25 April 1995/Accepted: 26 April 1995

SUMMARY :

Interpolymer complexes of poly (ethylene imine) (PEI) with an acrylic copolymer, and a polymer blend with identical structural units have been prepared. The stability constant (K), degree of linkage (Θ), and related thermodynamic parameters (e.g. ΔH° and ΔS°) of the two complexes have been found to be widely different. The discrepancy has been interpreted in terms of cooperativity, neighbouring group influence, and sequence combination of comonomer units in the copolymer chain.

INTRODUCTION :

Study of interpolymer interactions has already occupied a unique position in the field of polymer science [1-3]. Such interaction products have already found wide applications in industries (4,5) and medicine (6). During the last decade, considerable amount of work have been done in this field both from theoretical and practical point of view [1-3]. However, relatively few references have been found in the literature regarding interpolymer complexes of copolymers. Obviously, the complexation involving copolymers will be more complicated, in view of the presence of possible non-interacting units in the copolymer chain, as well as different composition and sequence combination of comonomer units of the copolymer. The author's group has reported extensive study on interpolymer complexes of acrylic copolymers and highlighted the various factors which are likely to influence these systems (7-9). The difference of the previous and the present systems will be discussed elsewhere in the text. For the present investigation, an acrylic copolymer (e.g. methacrylic acid - acrylamide) (MA-AAm) of known composition has been chosen, and a polymer blend has been prepared by mixing the two acrylic homopolymers (e.g. PMA and PAAm) in the same proportion as present in the copolymer. Interpolymer complexes of both copolymer and the polymer blend have been prepared with a typical polyelectrolyte (e.g. poly (ethylene imine)(PEI)). Using Osada's procedure (10,11), stability constant (K), degree of linkage (Θ), and related thermodynamic parameters (e.g. ΔH° and ΔS°) of both the complexes have been determined. A comparative study of these parameters of complexes of the copolymer and the polymer blend indicated a very large variation of the values of these parameters. In this report, an effort has been made to interpret these discrepancies in terms of cooperative interaction, sequence combination of comonomer units, and a possible neighbouring group influence in the copolymer chain.

* Corresponding author