

The effects of zwitterionic and anionic charge densities in polymer chains on the viscosity behavior of a pH-responsive hydrophobically modified ionic polymer

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ABSTRACT

Sulfur dioxide, diallylcarboethoxymethylammonium chloride, and the hydrophobic monomer N,N-diallyl-N-octadecylammonium chloride were cyclocopolymerized in DMSO using azobisisobutyronitrile (AIBN) as the initiator to afford water-soluble cationic polyelectrolytes (CPE) having a five-membered cyclic structure on the polymeric backbone. The CPE on acidic hydrolysis of the pendent ester groups gave the corresponding cationic acid salts (CAS), which, on treatment with NaOH, were converted to polybetaines (PB) and anionic polyelectrolytes (APE), as well as polymers PB/APE containing various proportions of zwitterionic (PB) and anionic fractions (APE) in the polymer chain. The solution properties of the CPE, APE, and PB/APE systems containing varying amounts of the hydrophobic monomers in the range 0-4 mol % were investigated by viscometric techniques. Treating the pH-responsive CAS polymers with different equivalents of NaOH varied the zwitterionic and anionic charge densities in the polymer chain. It was found that the PB/APE polymer with a ratio of 33: 67 for the zwitterionic and anionic fractions in the polymer chain, respectively, gave the highest viscosity value. The polymers showed that a concentration (C^*_{HA}) of around 1 g/dL was required for the manifestation of significant hydrophobic associations.