

Synthesis and comparative solution properties of single-, twin-, and triple-tailed associating ionic polymers based on diallylammonium salts

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ABSTRACT

The cycloterpolymerizations of single-, twin-, and triple-tailed hydrophobes with hydrophilic monomer N,N-diallyl-N-carboethoxymethylammonium chloride and sulfur dioxide afforded a series of cationic polyelectrolytes (CPEs) in excellent yields. These CPEs, upon the acidic hydrolysis of the pendent ester groups, gave the corresponding pH-responsive cationic acid salts, which, upon a treatment with sodium hydroxide, were converted to polybetaines (PBs), anionic polyelectrolytes (APEs), and PB/APE polymers containing various proportions of zwitterionic (PB) and anionic fractions (APE) in the polymer chain. At a shear rate of 0.36 s^{-1} at 30° , salt-free water solutions of the CPEs (2 g/dL) containing 8, 4, and 2.67 mol % of the single-, twin-, and triple-tailed hydrophobes (all having 8 mol % octyloxy tails) had apparent viscosity values of 70, 2800, and 396,000 cps, respectively. The PB/APE polymer with a ratio of 33:67 for the zwitterionic and anionic fractions in the polymer chain gave the highest viscosity value. The superior viscosity behavior of the polymers containing the triple-tailed hydrophobe was attributed to the blocky nature of the comonomer.