摘要

Special Topic: Aggregated-Induced Emission

Probing the pH-dependent chain dynamics of poly(acrylate acid) in concentrated solution by using a cationic AIE fluorophore

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Abstract: We report a novel strategy to study the chain dynamics of poly(acrylic acid) (PAA) in a relative concentrated solution (1.0 g/L). The strategy is based on the fluorescent probe (DCTPE) with unique aggregation-induced emission (AIE) characteristics. Free DCTPE molecules are non-emissive in aqueous solution, but they become highly emissive when trapped in polymer coils. The fluorescence intensity is proportional to the efficiency of trapping DCTPE molecules in polymer coils. By correlation the change of fluorescence intensity with the variation of pH value (from 1.78 to 12.06), the PAA chain's dynamics in the relatively concentrated solution have been elucidated into three processes. In the pH range from 12.06 to 6.0, PAA chains take an extended and non-folding conformation. Changing pH from 6.0 to 3.86, PAA chains are partially protonated and loosely packed polymer coils are formed. Further lowering the pH value of the solution (from 3.86 to 1.78), protonated segments dominate the PAA chains, and at the same time, the intermolecular hydrogen bonding takes effect, thus the polymer chains possess in the conformation of more compact coils.

Keywords: polyelectrolyte, polymer dynamics, coils, concentrated solution, aggregation-induced emission

An illustration of the dynamic conformation changes of PAA chains at different pH values. PAA concentration: 1 g/L.