

Nanocomposites and nanomaterials

The nature of the poly(sodium styrenesulfonate) macromolecule microenvironment in aqueous solutions as studied by acid-base indicators as molecular probes

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The microenvironment of polyelectrolyte molecules as well as surfactant clusters has been studied by molecular probes [1]. Our investigation deals with poly(sodium styrenesulfonate) (NaPSS) and cationic indicators neutral red (NR) and methyl yellow (MY). The size of coiled macromolecules is 9–13 nm in pure water and in 0.05 M NaCl solution, as determined by dynamic light scattering, whereas the zeta-potential in water is negative (–22 mV). The monomer polyelectrolyte concentration was chosen 60 times higher than indicator one to avoid the appearance of the metachromasia. The apparent ionization constants of indicators, pK_a^a , were obtained by standard spectroscopy technique [1]. The variation of the ionic strength, I , displays slight influence on spectra. For NR, at $I = 0.05$ M, pK_a^a is 7.96 ± 0.08 , for MY $pK_a^a = 3.58 \pm 0.06$ (with 9.6 vol.% EtOH).

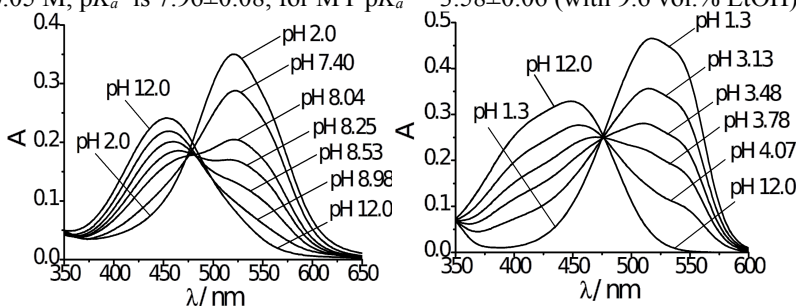


Fig. 1. The absorption spectra at different pH values of NR (left) and MY (right, with 9.6 vol.% EtOH) at $[\text{NaPSS}]/[\text{Dye}] = 60$; $I = 0.05$ M (NaCl).

In this report, the utilization of thus obtained pK_a^a values for gaining insight into the properties of the polyelectrolyte ‘surface’ region is discussed.

1. Baumgartner E., Fernandez-Prini R., Turyn D. Change of apparent acidity constant of indicators in polyelectrolyte solutions // J. Chem. Soc., Faraday Trans. 1.-1974.-**70**.-P. 1518-1526.