Polyelectrolytes with guanidine structural motifs: From internal chain dynamics to the formation of interpolyelectrolyte complexes

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The guanidinium ion has the ability to form dimers (Fig. 1a) despite like charges of the group due to its Y-conjugated pseudoaromatic character [1]. The unique combination of this short-range attractive interaction of guanidinium groups with the long-range electrostatic repulsion between them is the reason for the distinct behavior of polyelectrolytes bearing guanidinium side groups. In this communication, we present the results of a solution behavior study of two classes of polyelectrolytes containing guanidine structural motifs in their monomeric units.
(1) Polyelectrolytes with guanidinium side chains, synthesized by guanylation of polyallylamine (GPAs, Fig. 1b). By comparing polyallylamine with its partially and fully guanylated derivatives, we follow the influence of the modification on polymer's conformation and dynamics in a broad range of length scales (from single coils to aggregates and from internal chain motion to translational diffusion) using scattering techniques (static and dynamic light scattering, SANS, neutron spin echo spectroscopy) and DOSY NMR.
(2) Polyelectrolytes synthesized by condensation of biguanide derivatives with formaldehyde. The biguanide condensates, bearing guanidine structural motifs in both the side groups and in the backbone, can have a complex structure as the condensation can lead to branching of the polymer chain. We will focus on the solution behavior of the metformin condensate (MFC, Fig. 1c) as well as the formation of core-shell nanoparticles with double-hydrophilic polyanion poly(methacrylate)- *b* -poly(ethylene oxide). The formation occurred at much lower MFC/PMAA–PEO ratios than would correspond to the isoelectric point, yielding strongly negatively charged nanoparticles, suggesting the role of specific interactions in the stabilization of the MFC/PMAA complex [2].

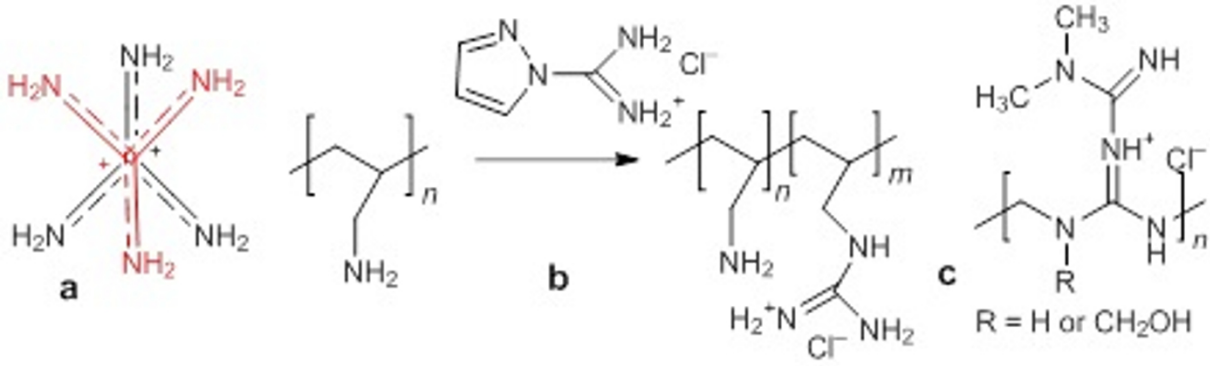

Fig. 1. (a) guanidinium ion pair, (b) scheme of polyallylamine guanylation, (c) metformin condensate

References:

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