

Insight into the self-assembly behavior of nanostructured amino acid-deriving polymers

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Polyamidoaminoacids (PAACs) are a new class of stimuli-responsive bioinspired chiral polymers. Recently, amphoteric PAACs isomers named ARGO7 were obtained by the polyaddition of L-, D- and D,L-arginine to an aqueous solution of N,N'-methylenebisacrylamide.^[1] Molecular modeling studies in water showed that L- and D-ARGO7 folded into rigid and compact conformations driven by the polymer main chain flexibility. In order to demonstrate that the observed behavior was a general one, a library of amphoteric PAACs were synthesized from different L-, D- and D,L α -aminoacids by stepwise polyaddition to N,N'-methylenebisacrylamide. The reaction occurred in water at pH > 10 and 50 °C for 6 days with 92% yield, M_n from 4000 – 6000 and PD 1.40. Hydrodynamic radius (R_h) was determined by Dynamic Light Scattering (DLS), revealing only one family of nanoparticles with 1.5 nm average radius. CD spectra, recorded in the 3-12 pH interval, were consistent with the presence of pH-dependent ordered secondary structures, whose changes with pH were rapid and fully reversible. The dependence on temperature, ionic strength and presence of denaturing agents was assessed for the hydrophobic α -aminoacids deriving PAACs. CD spectral pattern were insensitive to all these parameters, suggesting highly stable and rigid structures. Future studies on cell internalization will assess the potential of PAACs for establishing chirality-dependent selective interactions with cell components.

Reference

A. Manfredi, N. Mauro, A. Terenzi, J. Alongi, F. Lazzari, F. Ganazzoli, G. Raffaini, P. Ferruti, *ACS. Macro Lett.*, **2017**, *6*, 987.