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Sequence Controlled Polymers

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Sequence controlled polymers are synthetic macromolecules, where monomer units of different chemical nature are arranged along the polymer chain in an ordered fashion. Monomer sequence is strictly maintained in many biomacromolecules such as DNA, RNA and proteins, thus monomer sequence regulation plays a key role in biology, complex self-assembly, data storage and molecular recognition.[1-3] Recently, efforts have been initiated in developing complex synthetic polymers containing controlled monomer sequence throughout the polymer chain. In this regard, few novel strategies have been proposed in the literature for controlling sequences of monomers in chain-growth and step-growth polymerizations. In chain-growth polymerization, sequence regulation can be attained by using specific comonomer pairs consisting of an electron-donor monomer and an acceptor one. Herein, we have synthesized copolymers composed of *tert*-butyl carbamate (Boc)-protected D-alanine appended styrenic monomer (donor, **1**) and *N*-substituted maleimide monomer bearing L-alanine in the side chain (acceptor, **0**) *via* reversible addition-fragmentation chain transfer (RAFT) polymerization. The RAFT polymerization ensured targeted molecular weight of the polymers, narrow molecular weight distribution (dispersity (*Đ*)) and precise chain-end functionality. Characterization of the polymers by ^{13}C NMR spectroscopy confirmed that the monomers are copolymerized in an alternating manner to give a **01** sequence, because in these specific combinations of monomers, cross-propagation is favoured over homopropagation.

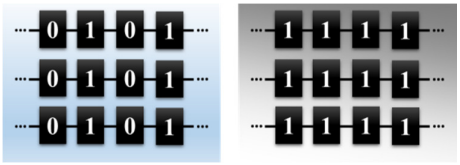

Figure. Precise monomer distribution in the polymer chains. Comonomer pairs (**0** and **1**) arranged in an alternating fashion (left) in the alternating copolymer. Distribution of monomers in homopolymer of styrenic monomer (**1**).

References

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