

# MONOMER SEQUENCE CONTROL VIA LIVING ANIONIC POLYMERISATION

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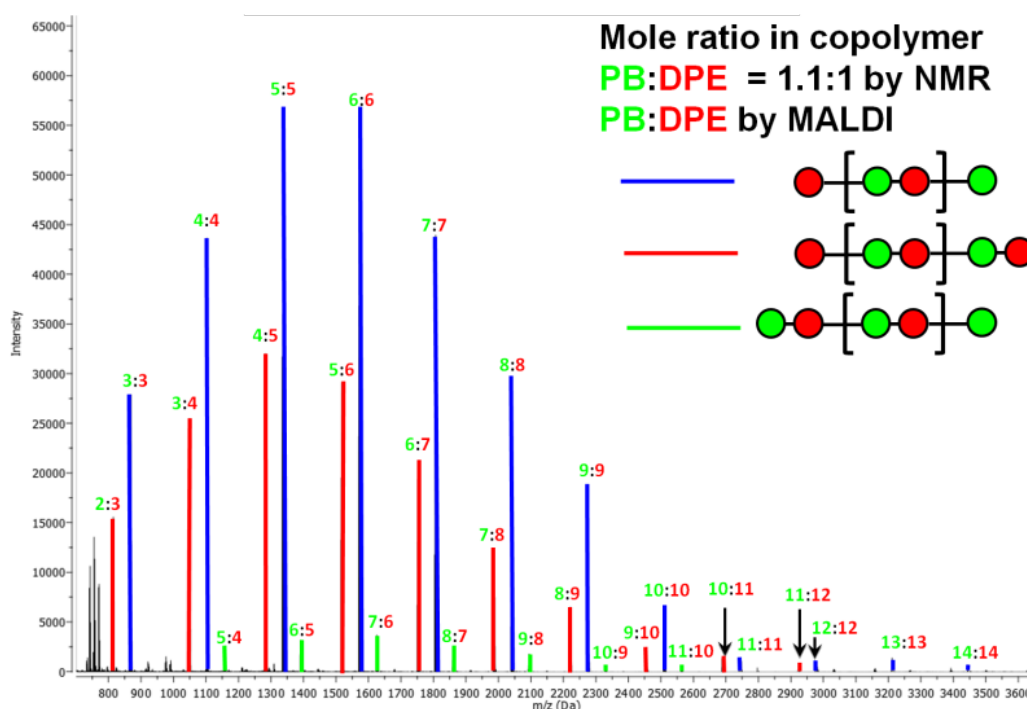
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## ABSTRACT

Natural polymers such as nucleic acids and proteins are the blue print of the living world with repeat unit sequences perfectly reproduced from molecule to molecule. It is this absolute control over the specificity of monomer sub-units that directs the secondary and tertiary structure and, in turn, form and function. Sequence control in synthetic polymers is a subject that has recently become an area of intense research having been almost totally neglected for many decades.

One method of controlling/influencing monomer sequence distribution is through kinetic control arising from differential monomer reactivity. We present herein the results of anionic copolymerisation using diphenylethylene (DPE) and its derivatives which enable the synthesis of perfect alternating copolymers, sequence controlled terpolymers and telechelic polymers. Moreover, each in reported molecular architecture, the resulting monomer sequence is **entirely** controlled by reaction kinetics and all monomers are present from the start on the reaction. As such these copolymerisation reactions are effectively a contrived statistical copolymerisation whereby all monomers are polymerisation simultaneously in what we (and others) have described as a “fire and forget” approach.

The composition of the copolymers prepared in this study were analyzed by <sup>1</sup>H NMR and MALDI-ToF mass spectrometry, the latter offering a unique opportunity to demonstrate perfect alternating sequences and insight into other comonomers sequences such as telechelic polymers.



**Figure 1.** MALDI ToF mass spectrum for a poly(butadiene-DPE) alternating copolymer prepared by anionic copolymerization (monomer molar feed ratio of butadiene : DPE = 1.00 : 1.03).

## References:

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- Natalello, A.; Hall, J. N.; Eccles, E. A. L.; Kimani, S. M.; Hutchings, L. R., Kinetic Control of Monomer Sequence Distribution in Living Anionic Copolymerisation. *Macromolecular Rapid Communications* **2011**, *32*, 233.