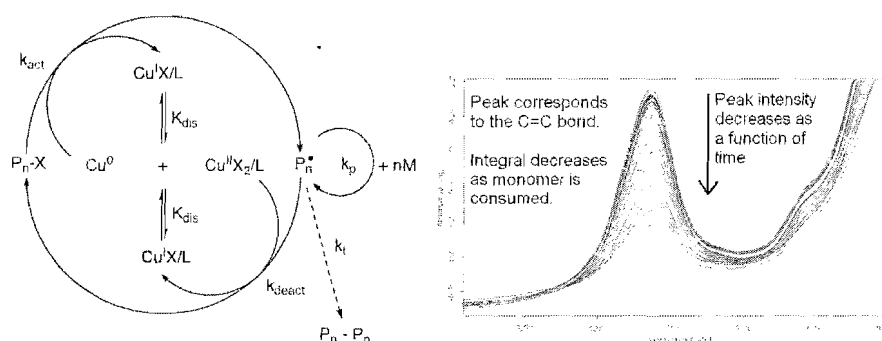


In-situ Online Monitoring of SET-LRP reactions via Near Infra-Red spectroscopy

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The technique of SET-LRP (Single Electron Transfer Living Radical Polymerisation) recently discovered by Percec^{1,2} facilitates the ultrafast synthesis of a wide variety of monomers at ambient temperature to create polymers with molecular weight control and narrow polydispersity. The process uses native copper metal instead of the Cu(I) species traditionally used in ATRP reactions, allowing for easier purification of the product.



Figures 1 and 2: Proposed mechanism for SET-LRP (taken from ref. 1) and the loss of the carbon-carbon double bond of the monomer over time, as observed using near-IR spectroscopy

The commercial potential of SET-LRP to synthesis macromolecules with novel properties that may be commercially exploited by the pharmaceutical and cosmetic industries is apparent. Real time data regarding the conversion and evolution of molecular weight distribution may be obtained using rapid GPC and SCOMP designed by Reed³ and developed by PolymerLaboratories.

A simple, accurate method for obtaining instantaneous conversion data *in-situ* using a near Infra-Red spectroscopy⁴ and fibre optic probe is demonstrated for the SET-LRP of methyl acrylate in DMSO and compared with ¹H-NMR information from manually extracted samples. Reactions proceed to 90% conversion in approximately 2 hours, with characteristics typical of living polymerisations observed and the final products are close to the molecular weight targeted.

References

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