



## Microemulsion Polymerisation Using $\gamma$ -ray Initiation — The Formation of Single Chain Latex Particles

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Synthetic polymer chains can be prepared more or less singly by the technique of microemulsion polymerisations (MEP), so that each microlatex particle formed contains only one polymer chain. Below  $T_g$ , these polymeric particles can be called single chain polymer glasses (SCPG). The conformation of a polymer in a single chain glass is in the compact form, in contrast to the expanded random coil conformation evident in conventional multichain polymer glasses (MCPG). The question is whether the physical properties of single chain glasses are identical with those of multichain glasses.

Experiments show that single chain polystyrene glasses (SCPS) display properties quite different from those of ordinary polystyrene (PS). This is apparent from measurements of their DSC, FTIR, WAXD, PALS and density. Such measurements all point to the one conclusion: that SCPS as prepared are more random than ordinary PS. Monomers other than styrene were also covered. Copolymers and crosslinked polymers were studied. The process of the particle formation was also studied. The formation of the superchain-like structure during the heating of some virgin SCPG is proposed to be responsible for the exhibition of a first-order-like DSC exotherm near  $T_g$ . It was found that there are two prerequisites for the formation of such superchain-like structure. That is, the phenyl ring in the monomer is essential and the compression factor must be more than *one*. The triad SSS is found to be the minimum length for such structure formation. It was also found that at the stage of conversion 47%, MEP starts to differ from the conventional emulsion polymerisation.

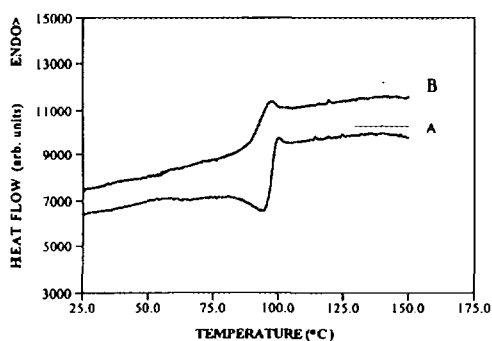


Figure 1 DSC of single chain Poly(vinyltoluene) prepared by MEP with recipe TOL/DTAB/AIBN. A. First heating; B. Second heating.

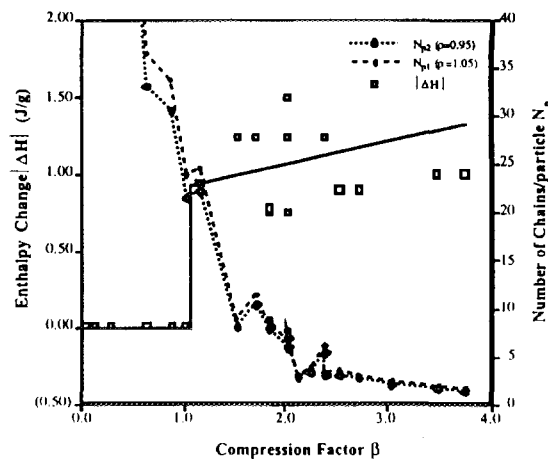


Figure 2 Enthalpy change  $|\Delta H|$  versus the compression factor  $\beta$  and the Number of chains/particle  $N_p$  versus  $\beta$ . For various recipes of SCPS.

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