

Determination of copolymer statistics in poly-L-lactide polyglycolide copolymers

The temporary course of a reaction between the homopolymers poly-L-lactide and polyglycolide in a melt was examined with high-resolution ^{13}C liquid state NMR. By interchain exchange copolymers develop during the reaction. Their composition and statistics depend on the reaction time while their character changes continuously from block forming to statistical. In figure 1 the signals of the carboxyle groups of copolymers are presented, the area from 168–169 ppm contains the signals of the glycolide CO groups, the area from 171–172 ppm contains the signals of lactide CO groups. By assigning the signals to the different possible bonds in the copolymer and their quantitative evaluation copolymer statistical parameters like block numbers and average sequence length were determined and compared to the theoretically calculated values for purely statistical copolymers of equal composition. The number averaged sequence lengths I_L and I_G for the lactide and glycolide sequences of copolymers, respectively (figure 2) decrease with increasing reaction time and after 90 minutes approach the values for purely statistical copolymers.

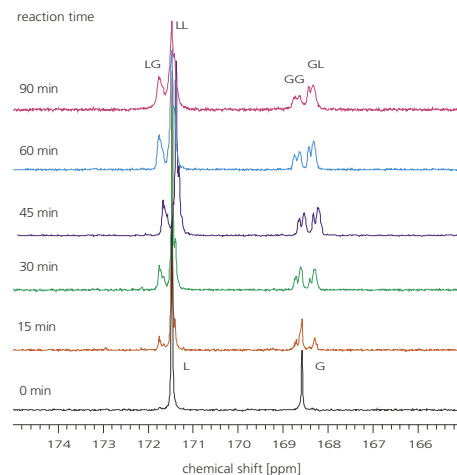


Figure 1
 ^{13}C -NMR spectra of poly-L-lactide polyglycolide copolymers, transformation from block-like to statistical structure.

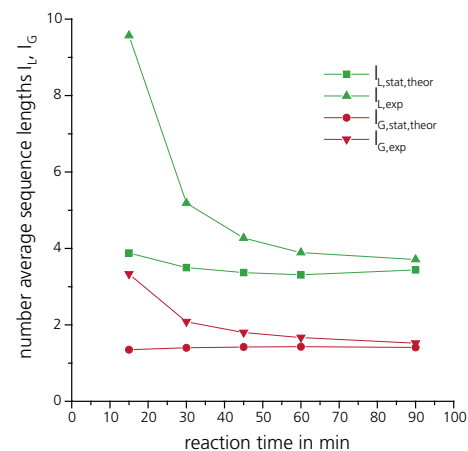


Figure 2
Number averaged sequence lengths of poly-L-lactide polyglycolide copolymers depending on the reaction time.