

Insight into Hydrolytic Scission Mechanisms in Bioerodible Polyesters

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ABSTRACT

PLLA, PDLLA and PLGA copolymers have been examined for the details of their degradation behaviour. All polymers exhibited a homogeneous mode of degradation, with uniform rates of degradation throughout the film. Crystallinity inhibited water absorption, and hence retarded degradation. Addition of GA units substantially increased degradation rates, and this effect overwhelms the effect due to crystallinity. The glycolide linkage is more susceptible to hydrolytic scission than lactide, as verified quantitatively with the use of ¹H-NMR studies. In spite of the faster degradation rate for the GA units, the overall scission is still a random process, as verified by the application of a Monte Carlo model to the degradation results. The details of the mechanistic study of different factors influencing the process of degradation as reported here, may have important implications in terms of selecting the right material for specific biomedical applications.

Keywords: Random scission, proton NMR, glycolide scission, effect of crystallinity and effect of copolymer composition