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Degradation and related changes in supermolecular structure of poly(caprolactone) in vivo conditions

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Abstract

The degradation *in vivo* and its effect on the supermolecular structure of poly(caprolactone) was examined. Poly(caprolactone) (PCL) samples were prepared in the form of porous scaffolds implanted into rat calvarial defects. The degradation was investigated by means of gel permeation chromatography, wide angle X-ray scattering (WAXS), scanning electron microscopy (SEM) and differential scanning calorimetry (DSC). The study showed that the observed decrease of PCL crystallinity during degradation is accompanied by reduction of crystal size and/or perfection. The observed phenomenon could be explained by the presence of the high content of the low mobile fraction of investigated polymer, consisting not only almost 50% of crystal fraction but also most probably relatively high fraction of s.c. rigid amorphous fraction (RAF). Considering the type of structure characterized by the dominance of low mobile fraction, it is expected that the degradation will mainly concern these fractions, which in turn will lead to a decrease in the degree of crystallinity as well as crystal size and/or perfection.

Keywords

PCL degradation, in-vivo conditions, crystallinity, rigid amorphous fraction

Introduction