

Bioresorbable Polymer Compounds



for implantable devices

Bioabsorbable Polymers Attributes

Synthetic

Inert to the body; biocompatible

Hydrolytically unstable

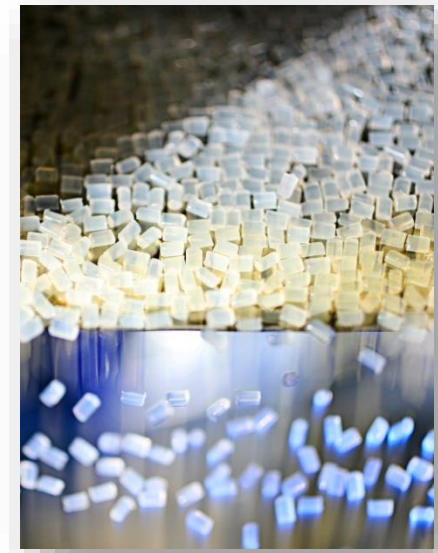
Absorbed in body and metabolized

Conventional melt processing

Sterilizable with gamma and ETO

Range of physical and degradation properties

Property modification: molecular weight; copolymerization



Applications



Sutures

Dental devices

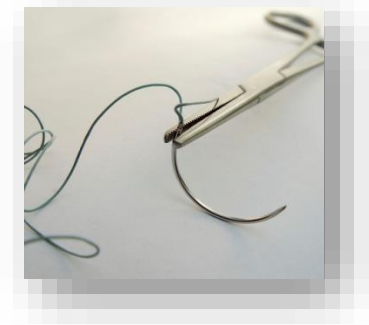
Orthopedic fixation

Controlled drug delivery

Tissue fixation

Biodegradable stents

Bone and tissue engineering



Bioabsorbable Polymers



PLA – polylactides

PGA – polyglycolides

PLGA – poly(lactide-co-glycolides)

PCL - Polycaprolactone

PolyGlycolides (PGA)

Highly crystalline

lower solubility in water

Absorbs quickly

loses strength within 1 month

loses mass within 6 -12 months

Melt point: 225 – 230 C

Glass transition: – 35 – 40 C

High modulus

PolyLactides (PLA)

PLLA

slow rate of absorption (>2 yrs)

highly crystalline

glass transition: 50 – 80 C

melt point: 173 – 178 C

high modulus (load bearing applications)

PDLA

faster absorption rate than PLLA



Poly(lactic-co-glycolic acid) (PLGA)

Copolymer

Properties based on ratio of lactide to glycolide

Amorphous

Glass Transition: 40 - 60C

Very good solubility

Degradation depends on ratio of above

50/50 ratio absorbs in about 2 months

Polycaprolactone (PCL)

Low melting point: 60 C

Glass transition temperature: -60C

Often used as additive to improve
processing & end use properties

Slow degradation rate (>2yrs)

Factors Affecting Biodegradation

Chemical structure & composition

Molecular weight & distribution

Morphology (amorphous/crystalline structure)

Site of implantation

Part shape and design

Mechanism of hydrolysis (enzymes v. water)

Processing & handling conditions

- Annealing

- Sterilization process

- Storage history

- Drying

- Presence of additives



Foster Experience

Range of Bioresorbable Polymer Compounds
Small Volume Manufacturing

1/2 lb sample

10+ lb production

Low/medium shear screw configurations

Can hold tight tolerances

Appropriate drying capabilities

2 plants environmentally controlled

Las Vegas, Nevada facility

Putnam, CT

Packaging capabilities

metalized bags, poly bags, vacuum canning