



ABSORV[®]
BIOABSORBABLE POLYMERS

ADVANCED POLYMER SCIENCE FOR NEW TECHNOLOGIES

Absorbable polymers used in medical and pharmaceutical applications are biocompatible, degrade over time and are eventually absorbed by the body. Many are polyester-based. Some have material properties similar to more traditional plastic materials such as polyethylene and polypropylene.

Zeus is a leading innovator in the extrusion of absorbable polymers in advanced medical industries, based on more than four decades of advanced material science and precision extrusion capabilities. Often engaging with customers during development, we are able to develop and deliver advanced polymers to meet desired degradation rates and other specifications.

With a focus on innovation, Zeus continues to provide superior products with the highest standards of quality and control. Through extensive investments in research and development, Zeus is able to extrude biomaterials into high precision tubular geometries and perform full polymer characterization to provide necessary data to meet regulatory requirements. Our capabilities include tight tolerance extrusion, formulations, customization, sophisticated materials science, multiple combinations of the product, and degradation profiles.

ADVANCING YOUR IDEAS

Your ideas have the potential to transform the world. The right partners will help make it happen. Talk to Zeus about how polymer science can advance your ideas. We welcome the opportunity to collaborate with you.

APPLICATIONS:

- **Orthopedic** – fracture fixation plates, pins and screws, bone augmentation, nails (*scaffolding*)
- **Dental** – Packing, dry socket treatment, scaffolding
- **Surgical** – Ligament repair, wound closure (*sutures, suture anchors, skin staples, and adhesives*), adhesion barriers, drug delivery, antineoplastic delivery, ligating clips, hemostasis clips, temporary RO markers
- **Stents** – vascular, coronary, biliary, ureteral, esophageal, etc.
- **Tissue engineering** – 3-D structures, electrospinning, molded, extruded vascular graft with scaffolding, guided nerve regeneration, percutaneous devices with limited ingrowth, tissue engineering scaffolds, vehicles for controlled drug and therapeutic agent delivery

KEY PROPERTIES:

- Modulated degradation rates
- Varying strengths and stiffness
- Multiple extrusion forms
- FDA-approved for medical devices
- Tailored to customers' specifications

ZEUS CAPABILITIES:

- Tight tolerance extrusion
- Sophisticated materials science
- Advanced processing and development
- Multiple combinations of the product

PRODUCT FEATURES:

- Capable of safely existing and being absorbed in the body
- Finite functionality
- Absence of stress shielding associated with long term permanent implants
- Controlled/gradual rate of bioabsorption or degradation

SUMMARY OF PROPERTIES					
Materials	Tg (C)	Tm (C)	E (Gpa)	σ (MPa)	Mass Loss (months)*
PLLA	60	180 - 190	3.0 - 4.0	65	18 - 36
PGA	40	215 - 225	6.0 - 7.0	95	4 - 6
PDLLA	55	amorph	1.0 - 3.0	40	12 - 16
PCL	-60	55 - 65	0.2 - 0.4	25	24 - 36
PLGA (85L/15G)	55	140 - 150	2.0 - 4.0	65	12 - 18
PLGA (82L/18G)	50	135 - 145	2.0 - 4.0	60	12 - 16
PLGA (10L/90G)	42	202 - 210	3.0 - 6.0	45	3 - 4
PDLGA (50DL/50G)	45	amorph	2.0 - 4.0	45	1 -2
PLDLA (80L/20DL)	60	115 - 130	2.0 - 4.0	50	12 - 18
PLC (70L/30C)	20	105 - 115	0.02 - 0.04	3	12 - 24

*Approximate values for a small selection of absorbable materials processed by Zeus.