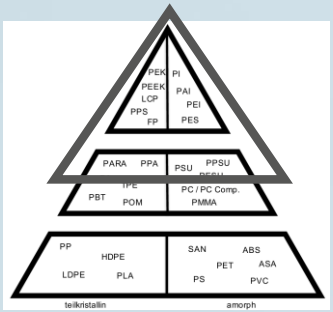
Biesterfeld

Competence in Solutions

High performance Polymers

High performance Polymers



What to fulfil?

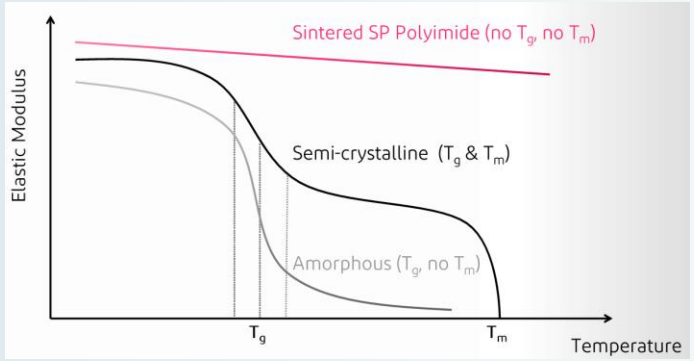
- Sterilization
- Certification
- High temperature
- Chemical Resistance
- Hydrolysis resistant
- Processability
- Compatibility
- Flame Retardancy
- Highest Mechanical properties
- Transparency & Colors
- dimensional stability
- Bio compatibility
- Isolation & conductivity
- Costs
- Availability

High performance Polymers

High temperature performance

VESPEL® SP1 / SCP-5000 Polyimide (unfilled base resin)

- No glass transition temperature
- Decomposition temperature >> 400°C
- Short term use up to 480°C
- Low wear and/or low friction
- Low thermal conductivity



Bildquelle: Präsenation Vespel® Webinar February 2021, Ruth Jackowiak

➢ Often used for valve seats, sealing rings, insulators

High performance Polymers

Bildquelle: Sulfone Polymers Training 2020, Solvay

Bio compatibility according ISO 10993

For limited exposure applications having less than 24 hours contact with bodily fluids and tissue

Udel® PSU, Veradel® PES, Radel® PPSU – Sulfones

- Excellent thermal stability / High-heat resistance
- High mechanical properties
- Sterilization possible (steam, ethylene oxide and e-beam radiation)
- Hydrolytic stability
- Transparency

Udel: Good mechanical and best optical properties of the sulfones

https://www.solvay.de/artikel/polymere-unterstuetzen-die-behandlung-von-nierenversagen

Veradel: Highest stiffness and best in price of the sulfones

Radel: Overall the best of the sulfones

➢ Often used for surgical instruments, cases and trays, medical devices

High performance Polymers

Bio compatibility according ISO 10993

For limited exposure applications having less than 24 hours contact with bodily fluids and tissue

Udel® PSU, Veradel® PES, Radel® PPSU – Sulfones

› Applications & Sterilization

	Orthopedics	Sterilization Cases & Trays	Medical & Dental Devices	Single-Use Instruments	Hemodialysis Membranes	Implantable Devices
High-Performance Medical Grade Plastics						
Udel® PSU		√	√	√	√	
Veradel® HC PESU	√		√	√		
Radel® PPSU	√	√	√			

Bildquelle: Healthcare-Specialty-Polymers_EN-v6.0.pdf

	Steam 18 minutes at 134°C			Ethylene Oxide Gas	Vaporized Hydrogen Peroxide	High-Energy Gamma Radiation
	10 cycles	100 cycles	1,000 cycles	100 cycles	200 cycles	40 kGy
High-Performance Medical Grade Plastics						
Udel® PSU	√	√		√	√	√
Veradel® HC PESU	√	√		√	√	√ (1)
Radel® PPSU	√	√	√	√	√	√

Bildquelle: Healthcare-Specialty-Polymers_EN-v6.0.pdf

High performance Polymers

ISO 10993 fit for different Test methodes

Biocompatibility testing

Test	Method	Veradel® HC PESU	Radel® PPSU	Udel® PSU
Complete characterization (1)	ISO 10993-18			
Physico-chemical	ISO 10993-18	✓	✓	✓
Cytotoxicity	ISO 10993-5	✓	✓	✓
Sensitization	ISO 10993-10	✓	✓	✓
Intracutaneous toxicity	ISO 10993-10	✓	✓	✓
Acute systemic toxicity	ISO 10993-11	✓	✓	✓
Subchronic toxicity	ISO 10993-11			
Genotoxicity	ISO 10993-3			
Bone and muscle implant tests	ISO 10993-6			
Hemolysis	ASTM F-756			
Pyrogenicity	USP 151			

(1) *Including exhaustive extractions and risk assessment*

Limited Contact <= 24 hours
Permanent Implant > 30 days

Bildquelle: Healthcare-Specialty-Polymers_EN-v6.0.pdf

Properties

Performance Properties	Udel® PSU	Veradel® HC PESU	Radel® PPSU
Compatibility with disinfectants	● (1)	●	● ● ●
Impact strength	● ●	● ●	★
High stiffness	●	●	●
Aesthetics, surface finish	● ● ●	● ● ●	● ● ●
Transparency	● ● ●	● ● ●	● ● ●
Colorability	● ● ●	● ● ●	● ● ●
Metal replacement (strength & stiffness)	●	● ●	●
UL 94 V-0	-- (2)	Yes	Yes
Low dielectric constant	● ●	● ●	● ●
ISO 10993 compliant grades	Yes	Yes	yes

Bildquelle: Healthcare Webinar: Medical Equipment, April 2020, Franziska Gresslinger

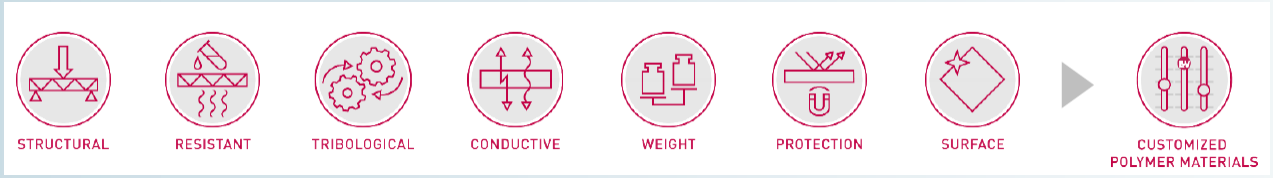
High performance Polymers

Customized polymer materials

Luvocom®

- All PA types / PPA / PES / PEK / PEEK / PEI / PEKK / PAEK / PPE / SULOFENS / …
- Fillers: CF / GF / GR / AR / MI / PTFE / Silicone oil / …
- Tribological / light weight / conductivity / FR / FDA, EU10/2011 / …

- 3‘000+ formulations … as you wish… or be able to pay;-)



Bildquelle: Präsentation Customized Polymer Material 2021, Lehvoss Group

➢ Often used for structural parts, automotive, medical devices, 3D printing (LUVOSINT)

High performance polymers

Conclusion

- Define must criteria / functional specification first
- as good as necessary not as good as possible

- Consider material selection from
  - Existing products
  - Knowhow by yourself and within own company
  - According own tests
  - Suppliers
  - Literature
  - Internet
  - Your other Networks

- Availability

Thank you for your attention!

Presented types

- VESPEL® SP1 / SCP-5000
- UDEL®
- VERADEL®
- RADEL®
- LUVOCOM®

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