



DEGRAD **INX**<sup>®</sup> U100

High Resolution Biodegradable Resin



DEGRAD INX<sup>®</sup> U100 is a polyester-based synthetic resin for multiphoton lithography (MPL) based 3D printing applications. It is the first ever biodegradable ink that combines the benefits of biocompatibility, flexibility and easy processability resulting in high feature resolutions (< 500 nm).

DEGRAD INX<sup>®</sup> U100 is suitable for the fabrication of 3D complex architectures for tissue engineering applications.

## SUPERIOR SHAPE FIDELITY AT HIGH RESOLUTION

The DEGRAD INX<sup>®</sup> U100 ready-to-use formulations can be processed via a multiphoton lithography based printer after a short pre-heating process. The resin can be processed at high scanning speeds (up to at least 600 mm/s) which is favorable for shorter fabrication times.

Figure 1 shows DEGRAD INX<sup>®</sup> U100 structures that were printed via MPL technology. Complex and open geometries can easily be printed via DEGRAD INX<sup>®</sup> U100 thanks to its mechanical robustness. The possibility to print structures with feature sizes below 500 nm is favorable for tissue engineering applications as well as systematic investigation of cell-material interactions in 3D.

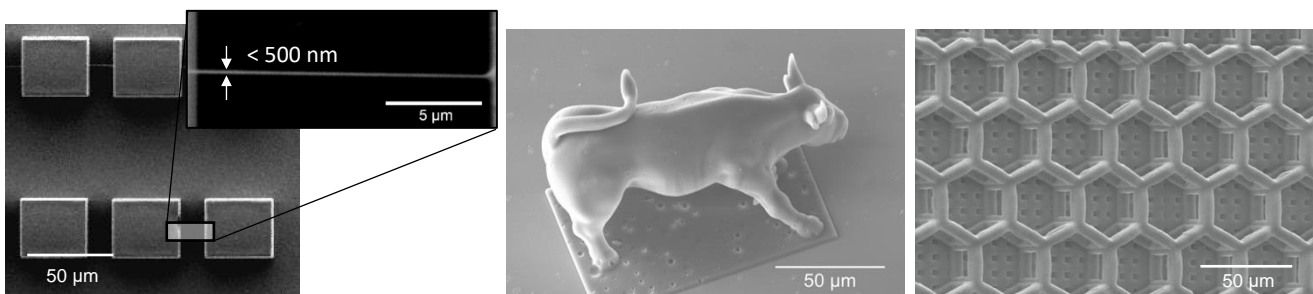


Figure 1: Scanning electron microscope images of the structures printed using DEGRAD INX<sup>®</sup> U100 via multiphoton lithography

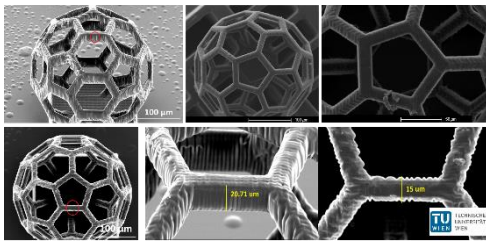


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## BIOLOGICAL APPLICATIONS & PUBLICATIONS

### CARTILAGE REGENERATION



DEGRAD INX® U100 has proven very suitable for the 'third strategy in tissue engineering'. Researchers of TUWien in the research group of Aleksandr Ovsianikov used DEGRAD INX® U100 for encapsulating cartilage spheroids suitable for injection to fill large tissue defects. The printed spheroid cages prevent shrinkage of the spheroids after merging and prevent formation of a necrotic core inside the constructs, while remaining suitable for injection of large cartilage defects. What's more, it was shown that the shape of the spheroid can be influenced by the printed structure. The biodegradability of the material ensures proper integration of the newly formed tissue with the tissue surrounding the tissue defect.

Read more:

Guillaume *et al.* Acta Biomaterialia, 2023, 165, 72-85

<https://www.sciencedirect.com/science/article/pii/S1742706122001416>

Kopinsky-Günwald *et al.* Acta Biomaterialia, 2024, 174, 163-176

<https://www.sciencedirect.com/science/article/pii/S1742706123007055>

## BENEFITS

- ✓ Biocompatibility      Exceptional biocompatibility (ISO 10993-5) with no toxic effect on living cells
- ✓ Biodegradability      Degradable in a long term (3-5 years) when in contact with water or biological fluids
- ✓ Processability        Easy processing into open and complex architectures with minimal deformation
- ✓ High resolution       Highest resolution ever reported for a biodegradable material (< 500 nm)
- ✓ Flexibility             Can generate strong yet flexible structures that are favorable for easy handling and processing
- ✓ Easy to handle        Provided as ready-to-print formulation in amber vials
- ✓ Reproducibility       Production under strict quality control to provide a material that delivers every time



## PROPERTIES & PROCESSING

DEGRAD INX<sup>®</sup> U100 is a viscous liquid at room temperature. It provides easy and fast processing given its wide processing window. Stable structures can be printed with DEGRAD INX<sup>®</sup> U100 using laser powers in the range 30-100 mW and scanning speeds up to at least 600 mm/s.

Physical Properties	DEGRAD INX <sup>®</sup> U100
Appearance	Yellow - orange liquid at 20°C
Viscosity (Pa.s)	0.5 - 3
Young's Modulus (MPa)	50 - 60
Ultimate Strength (MPa)	5 - 10
Elongation at break (%)	20 - 30

Upon printing & developing processes, DEGRAD INX<sup>®</sup> U100 results in strong yet flexible structures (Figure 2) with a high deformation energy (900-1000 kJ/m<sup>3</sup>). Compared to the highly rigid and brittle structures of current commercial organic-inorganic hybrids, this feature of DEGRAD INX<sup>®</sup> U100 makes it an excellent candidate for various applications requiring flexibility and easy handling. In addition to these features, DEGRAD INX<sup>®</sup> U100 has a degradation profile similar to the commercial linear poly( $\epsilon$ -caprolactone) (PCL), as observed in degradation tests that were conducted in accelerated conditions (Figure 3).

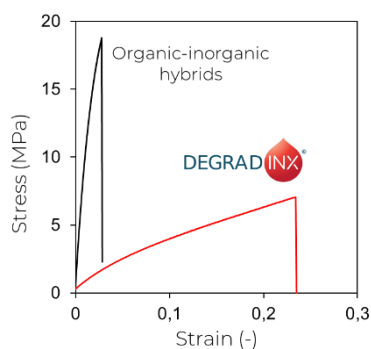


Figure 2: Stress-strain curve of DEGRAD INX<sup>®</sup> U100 after crosslinking

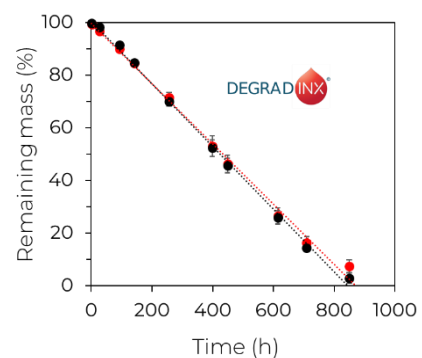















Figure 3: Degradation profile of DEGRAD INX<sup>®</sup> U100 and a commercial PCL tested in accelerated conditions



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## BENEFITS OF DEGRAD INX<sup>®</sup> U100

	Organic-Inorganic Hybrids	DEGRAD  U100
Strength		
Flexibility		
Biodegradability		
Biocompatibility		
High resolution		
High reactivity		

## 3D PRINTER COMPATIBILITY

DEGRAD INX<sup>®</sup> U100 has been used repeatedly and successfully with the following printers of Upano:

- ✓ NanoOne
- ✓ NanoOne Bio

If you would like to discuss your printer's compatibility with our resins, please contact us at [info@bioinx.com](mailto:info@bioinx.com)