DEGRES INX© X100

Light-based polyester printing

DEGRES INX© X100 is a polyester-based synthetic resin for digital light projection (DLP) based 3D printing applications. It is biocompatible and biodegradable with easy printability at resolutions down to 100 µm. Notably, the printed structures of DEGRES INX© X100 show a shape memory behavior, enabling shape transition at body temperature. With its unique physical properties, DEGRES INX© X100 paves the way for advancements in the biomedical field, promising a new era of possibilities.

BENEFITS OF DEGRES INX© X100

✓	Biocompatibility	Exceptional biocompatibility (ISO 10993-5) with no toxic effect on living cells
✓	Cell interactivity	Enables cell adhesion after applying a coating solution
✓	Biodegradability	Degradable in a long term (1 – 3 years) when in contact with water or biological fluids
✓	Shape memory	Unique shape transition behavior at body temperature, enabling minimally invasive surgery
✓	Processability	Easy processing into open and complex architectures
✓	High Resolution	Printable at resolutions down to 100 µm
✓	Flexibility	Produces flexible structures that are favorable for handling and processing
✓	Ready-to-use	Provided as a ready-to-use formulation
✓	Reproducibility	Production under strict quality control to provide a material that delivers every time

EASY & FAST PROCESSING

DEGRES INX© X100 ready-to-use formulation provides easy and fast processing given its fast crosslinking kinetics (Figure 1) and good mechanical properties. It enables fast processing via DLP printers employing low exposure times of 7 seconds per layer.

DEGRES INX© X100

Light-based polyester printing

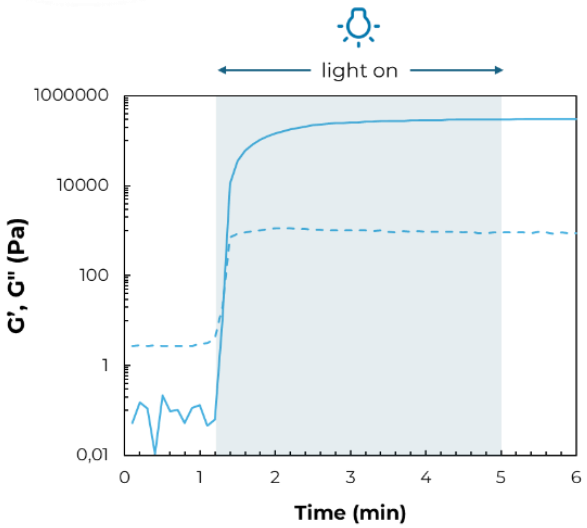

Figure 1. Storage (G', solid) and loss (G", dashed) moduli of DEGRES INX© as a function of time before, during and after light irradiation (400 – 500 nm, 20 mW cm^{-2})

The processing parameters of DEGRES INX© X100 are summarized in Table 1.

Table 1: Process parameters for DEGRES INX© X100

Wavelength	405 nm
Intensity	20 mW cm^{-1}
Exposure Time	7s / layer
Temperature	Room Temperature
Penetration Depth	100 – 150 µm
Negative Resolution (X-Y)	100 µm
Positive Resolution (X-Y)	100 µm
Negative Resolution (Z)	300 µm
Positive Resolution (Z)	100 µm

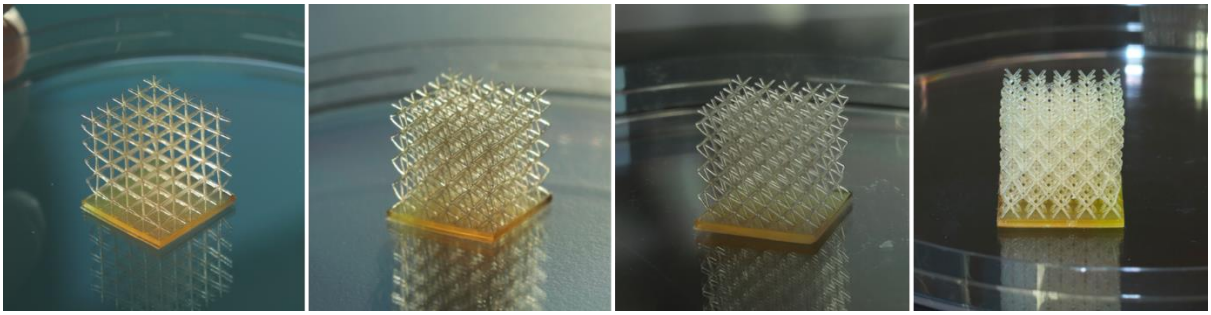

Figure 2. a 10 x 10 x 10 mm lattice structure printed using DEGRES INX© photographed from different angles, showing the capability of printing complex and open architectures.

ROBUST & FLEXIBLE

After washing and post-treatment processes, DEGRES INX© X100 results in strong and flexible structures (Figure 3).

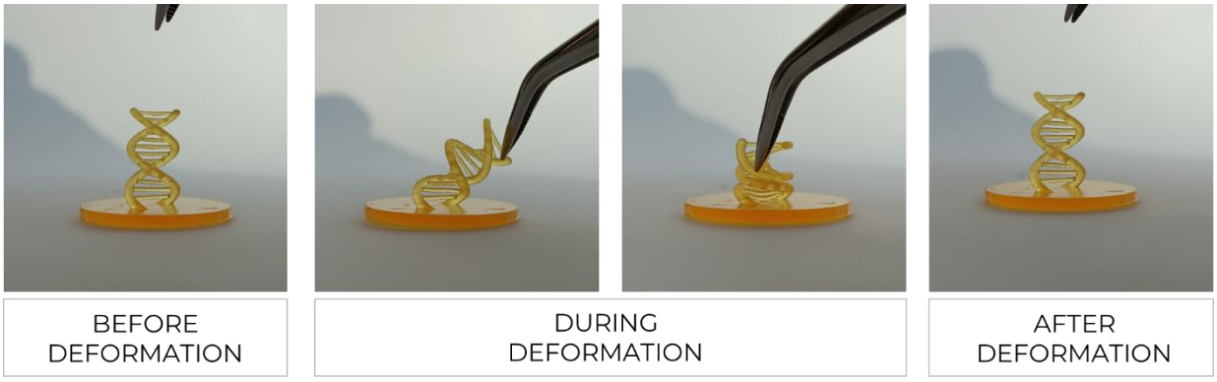

Figure 3. A DNA model printed using DEGRES INX© X100 showcasing its flexibility.

Material properties of DEGRES INX© X100 are summarized in Table 2.

Table 2. Physical properties of DEGRES INX© X100

Appearance	Yellow translucent liquid
Viscosity	0.05 – 0.60 Pa.s
Storage Modulus	50 – 500 kPa
Young's Modulus	1 – 2 MPa
Ultimate Strength	1 – 4 MPa
Elongation at Break	250 – 350 %

SHAPE MEMORY BEHAVIOR

DEGRES INX© X100 exhibits a shape memory behavior as demonstrated in Figure 4. When subjected to temperatures above 37 °C, the printed structure can be temporarily deformed using an external force, and subsequently fixed into this altered shape upon cooling (Figure 4b). When a suitable trigger is applied (re-heating at 37 °C), the material will readily recover its original shape (Figure 4c). The small sized temporary shape allows for minimally invasive surgery, which can then expand to its final shape upon implantation while accommodating irregular defects with precision and efficiency.

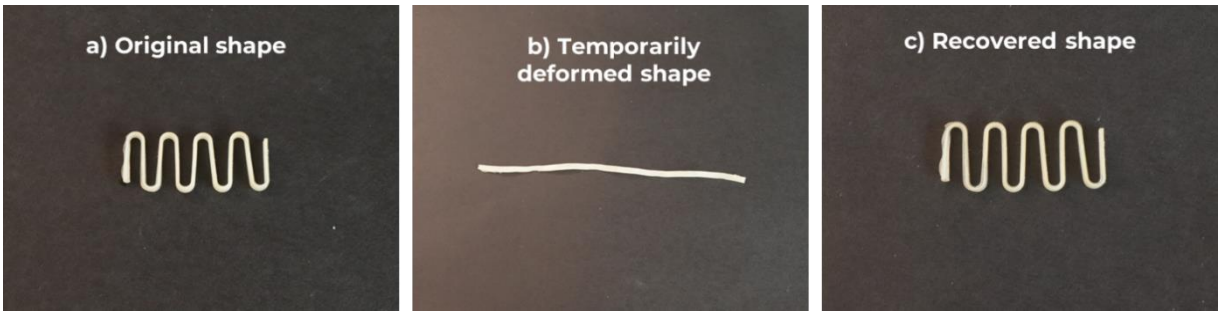

Figure 4. Photographs of a wave structure printed using DEGRES INX© X100: demonstrating the unique shape memory behavior. (A video demonstration can be found on youtube.com/@bioinx6574)

CELL-FRIENDLY

DEGRES INX© X100 has a limited cell interactivity as such, however, provides an excellent cell adhesion when coated BIO INX' biocompatible coating solution. A DEGRES INX© X100 gyroid scaffold seeded with Human Foreskin Fibroblasts (HFFs)can be seen in Figure 5.

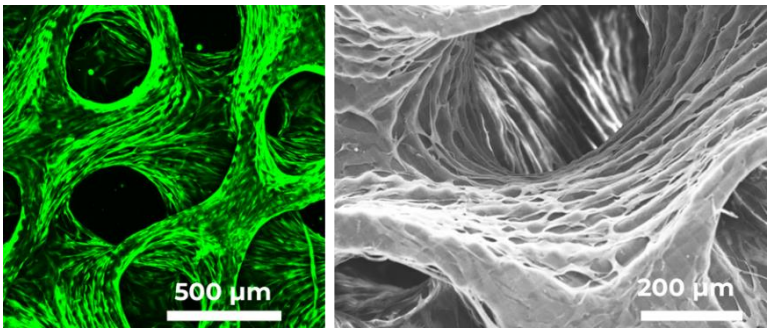

Figure 5. DEGRES INX© X100 gyroid scaffolds seeded with human foreskin fibroblasts imaged via laser scanning microscope (left) and scanning electron microscope (right) on the 28th day of the culture.

3D PRINTER COMPATIBILITY

Our resins have been used repeatedly and successfully with the following printers:

- LUMEN X
- LUMEN X+

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