LITHOZ

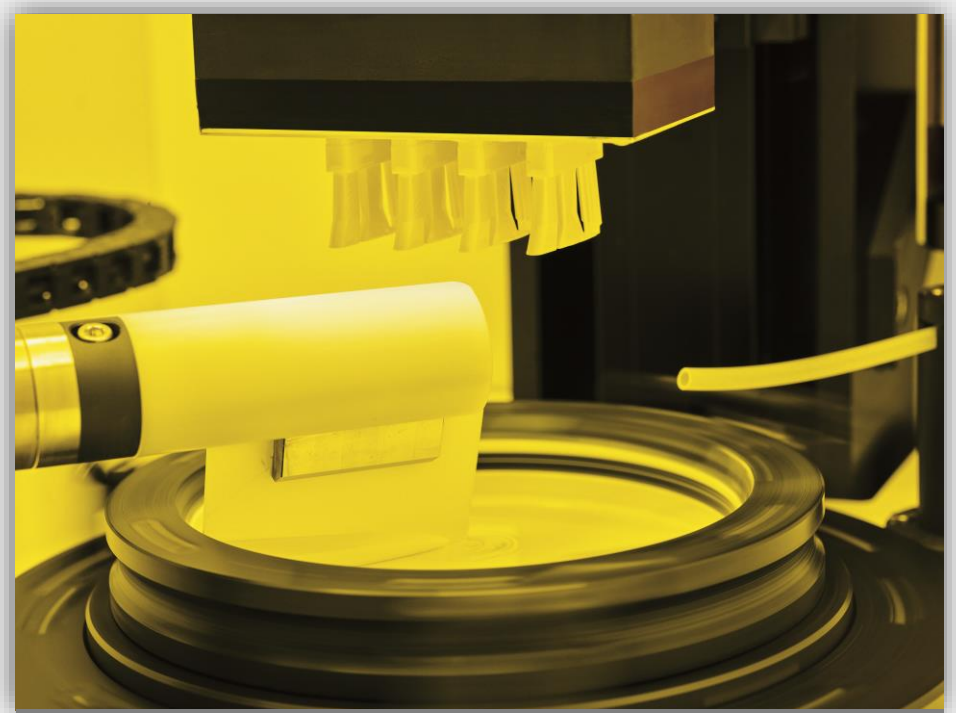
We are ceramic 3D printing.

AIDAinnova WP10

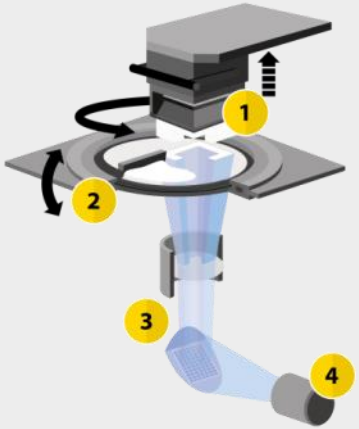
3D printed ceramics

Martin Schwentenwein

A closer look at our LCM Technology



Click to watch a video about the LCM technology



1 BUILDING PLATFORM

2 VAT

3 OPTICAL SYSTEM

4 LED

Blue light cures the photosensitive formulation

Process Chain

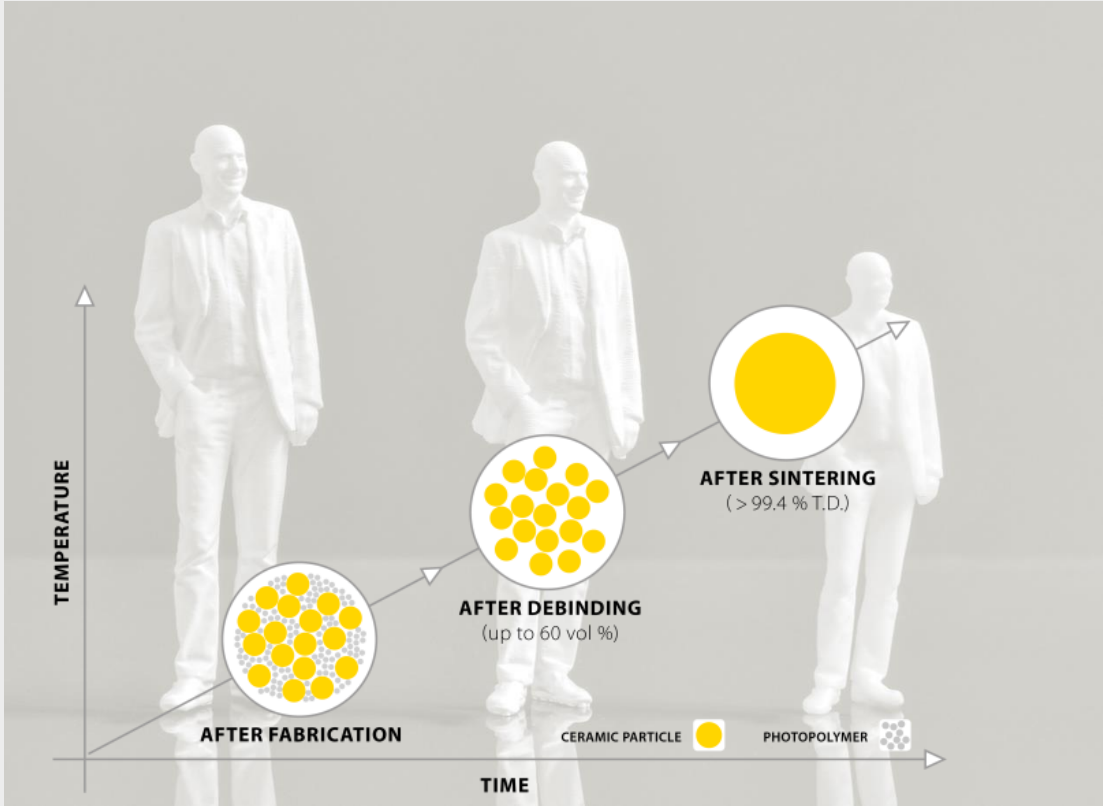
CAD DESIGN

3D PRINT

DEBIND, SINTER

FINAL PRODUCT

Debind and Sinter Process

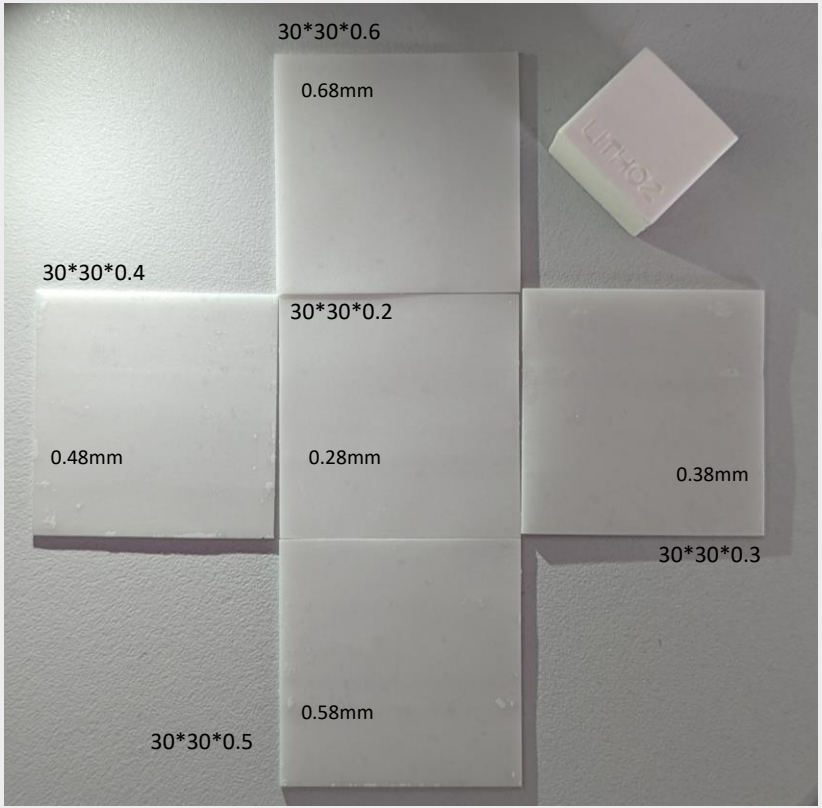


Aluminum oxide

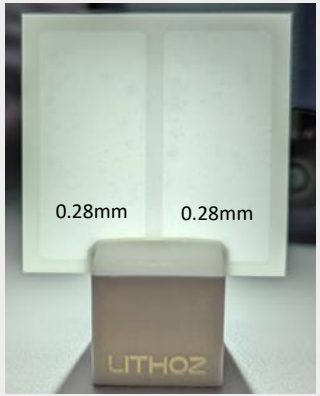
ID	Material	Number of pieces	Type
E22447	Alumina	7	Plates
E22448	Alumina	7	Plates
A22352	Alumina	6	Discs
A22354	Alumina	9	Discs
A22353	Alumina	8	Discs
A22355	Alumina	7	Discs

Aluminum nitride

Aluminium Nitride



30*30_frame_plate_4



Aluminium Nitride

- Tailoring of formulation
- Optimization of sintering
  - density of 3.35 g/cm³
  - Thermal conductivity: 212 W/m.K (preliminary)
  - Maximum wall thickness: 4 mm
  - Minimum wall thickness: 0.2 mm
  - Maximum aspect ratio: 10
  - Bending strength: 360 mPa (m = 10)

200µm thin plate

Comparison

- Aluminum oxide (Al_2O_3):
  - High maturity, robust, and well-commercialized 3D printing process
  - The present limit lies in the building envelope (maximum 190 x 120mm² x,y for the green part).

- Aluminum nitride (AlN):
  - 3D printing process works
  - Warping and deformations induced by the sintering steps are slightly greater for AlN than for Al_2O_3 (higher temperatures + inert atmosphere).
  - The building envelope limit remain the same

Aluminium Nitride

- Warping/deformation occurs particularly with parts with high aspect ratio such as thin plates;
  potential methods to solve this are:
  - Grinding/Polishing
  - Adaption of sintering method
  - Compensating warping by design (simulation)
  - Avoiding thermal post-processing

Grinding/Polishing

- Planning of trials with Fraunhofer IKTS from Germany
- Maximum component size that can be grinded under investigation
- Grinding equipment for preparation of test samples was just put into service at Lithoz

Adaption of sintering method

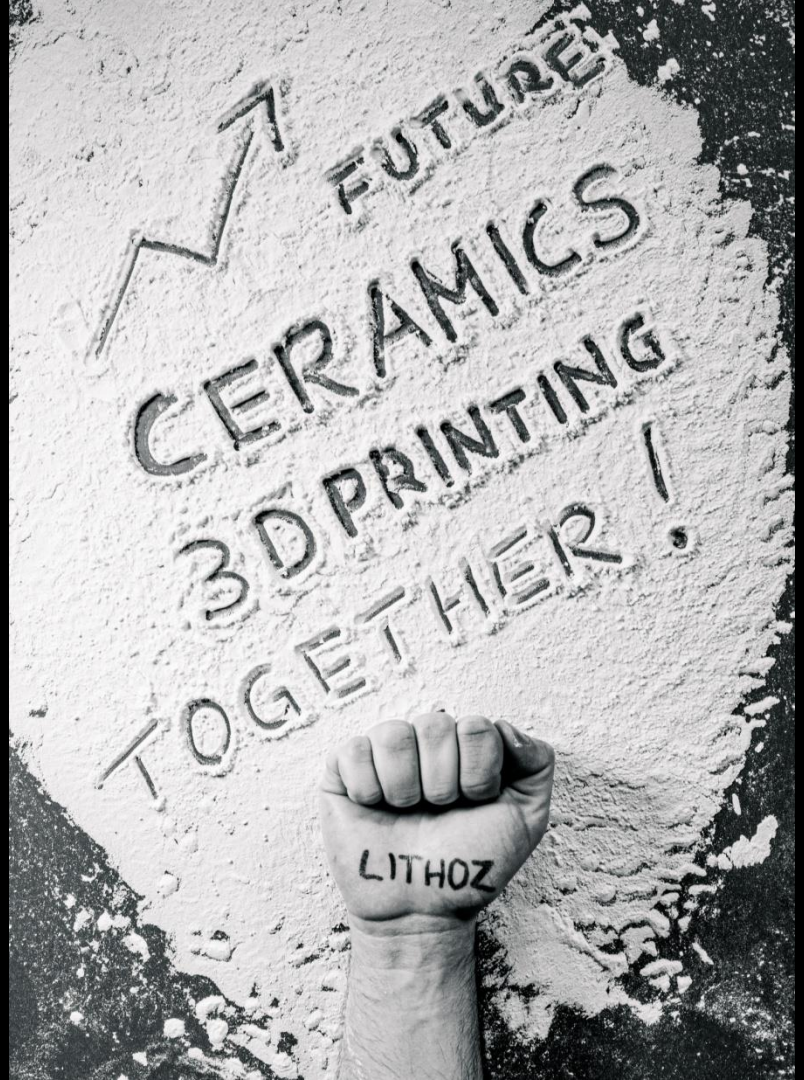
- Sintering trials with new service provider (FGK from Germany) ongoing
- First runs conducted, characterization pending

Simulation of debinding/sintering

- No activities are planned
  - Are there competencies in the AIDAinnova consortium?

Composites

- Avoiding debinding and sintering -> no shrinkage and thus no (or very limited) deformation
  - Composites based on standard polymer matrix are too soft
  - New polymer matrices only allow lower solids loading with AlN (18vol% vs 44vol%)
  - New Epoxy-based resins will potentially be provided by CERN



LITHOZ®

Manufacture the Future.

LITHOZ GmbH
Mollardgasse 85a/2/64-69
1060 Vienna/AUSTRIA
Phone: +43 1 9346612-204
mschwentenwein@lithoz.com

WWW.LITHOZ.COM