NANOE

WEBINAR

ζetamix Demo

Presented by G. De Calan

29, October 2020, 2 PM

I-CORPORATE

Industrial SME

Ceramic powder production

Alumina, Zirconia, ZTA/ATZ, Yttria

Batches > 1 T

Ready to use materials

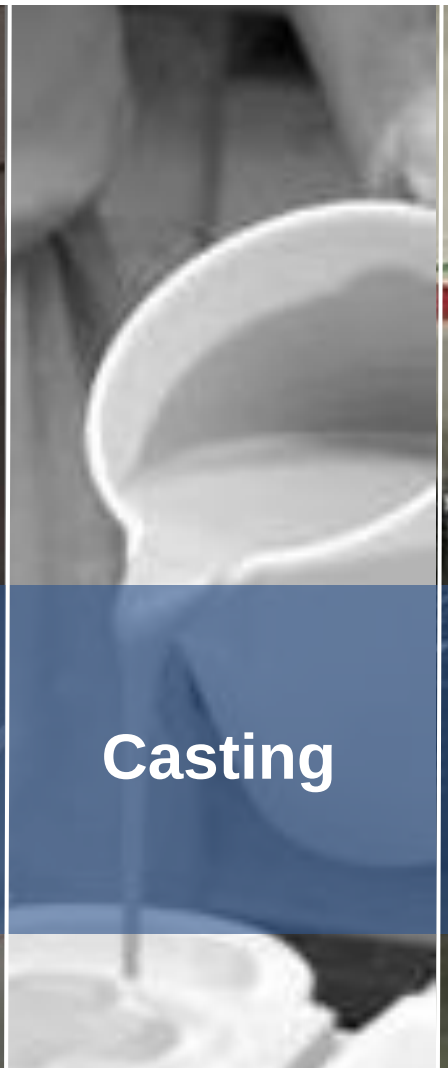
Focused on inovation

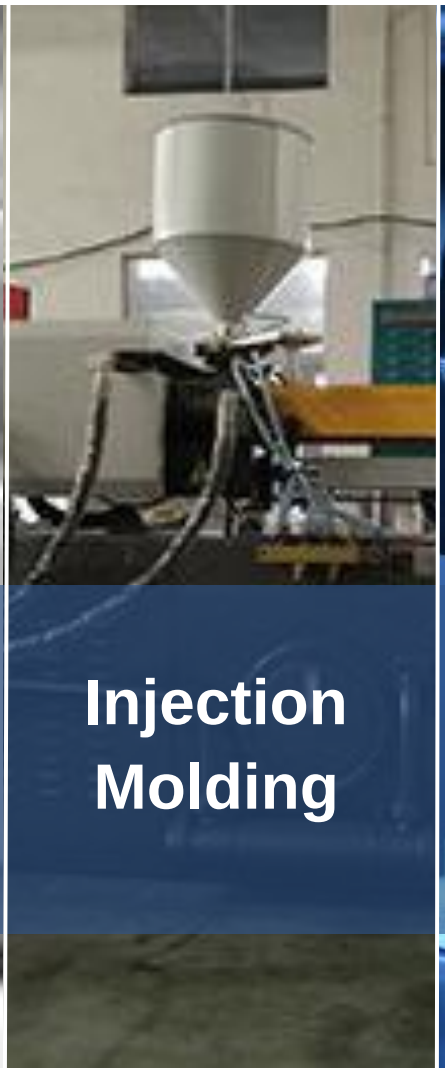
New material development

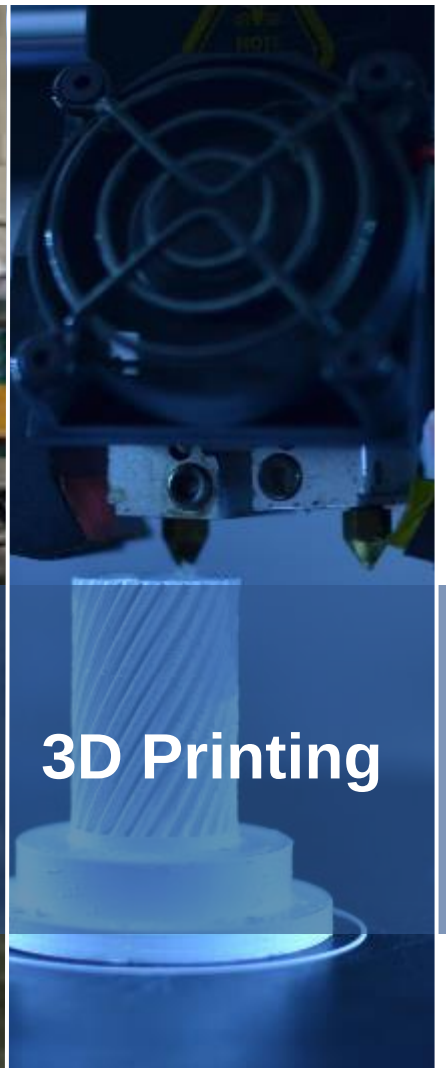
Customer centered R&D

3D printing materials

OUR CUSTOMER PROCESSES







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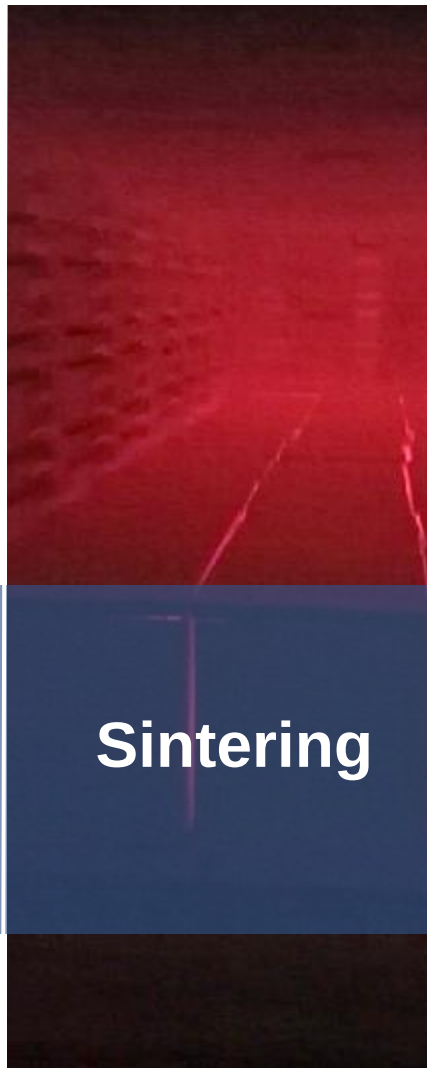
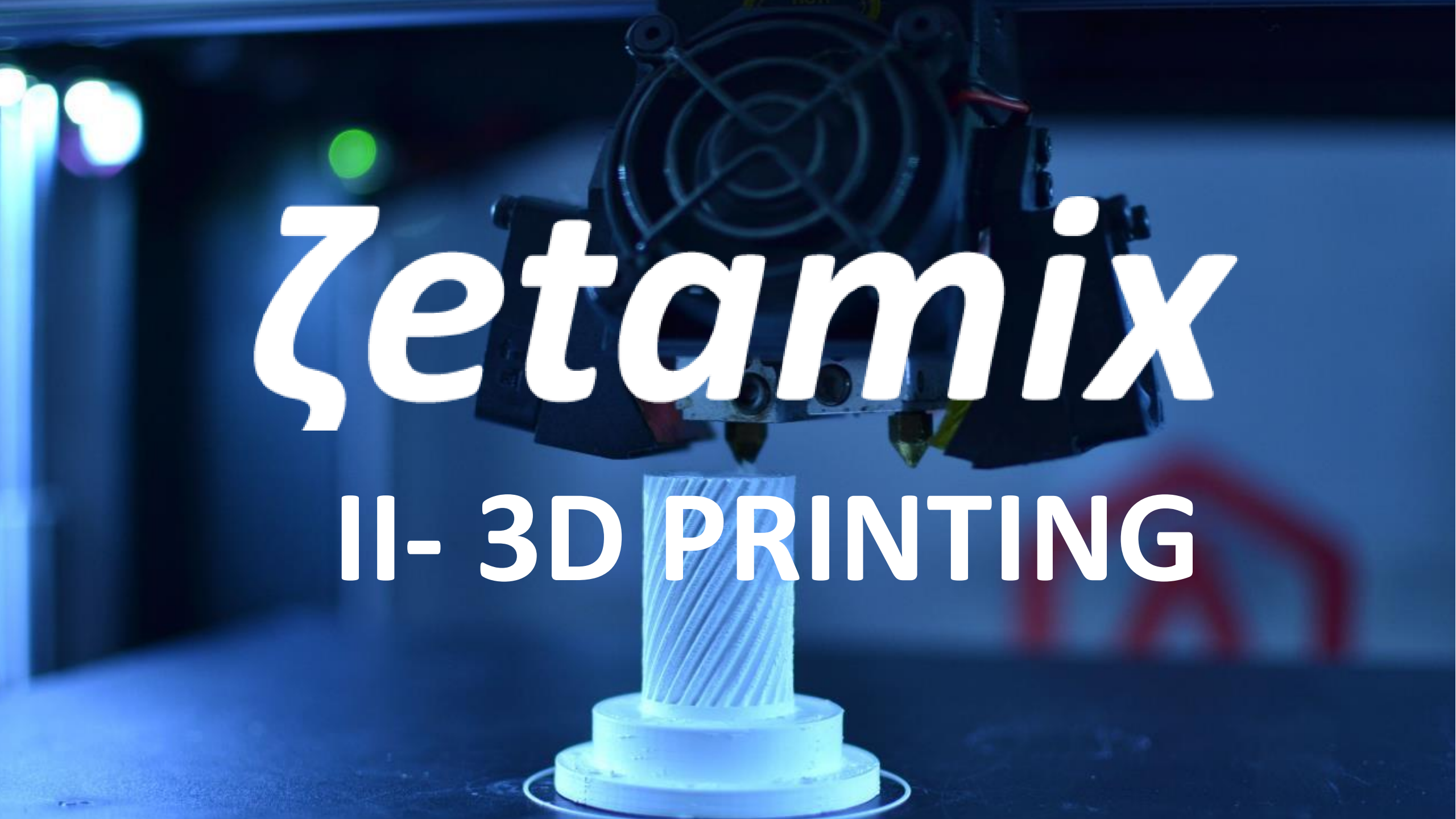


OUR APPLICATIONS


ζetamix
II- 3D PRINTING

NANOE'S CORE COMPETENCIES

Compounding of CIM/MIM feedtsock.

Blend of powder (> 50 vol%) and several binders (backbone, soluble phase, plastifier, tackifier, dispersant...) at melting temperature

Extrusion of highly loaded sinterable filaments

Alumina, **white zirconia, black zirconia, 316L**

NANOE'S CORE COMPETENCIES

Compounding

1

Powder + binders
High volumic loading
Controlled rheology

Extrusion

2

Extrusion temperature
Cooling
± 5% diameter

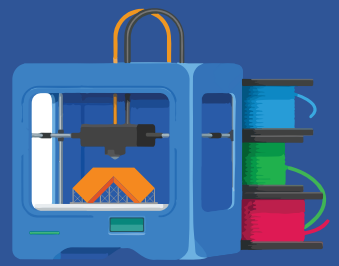
ZETAMIX PROCESS

Slicing

1

File preparation

Printing



2

Shape and precision
Surface finish
Green density

Debinding

3

Chemical debinding
Drying

Sintering

4

Thermal Debinding
Shrinkage

Final part

5

Final density
Mecanical properties

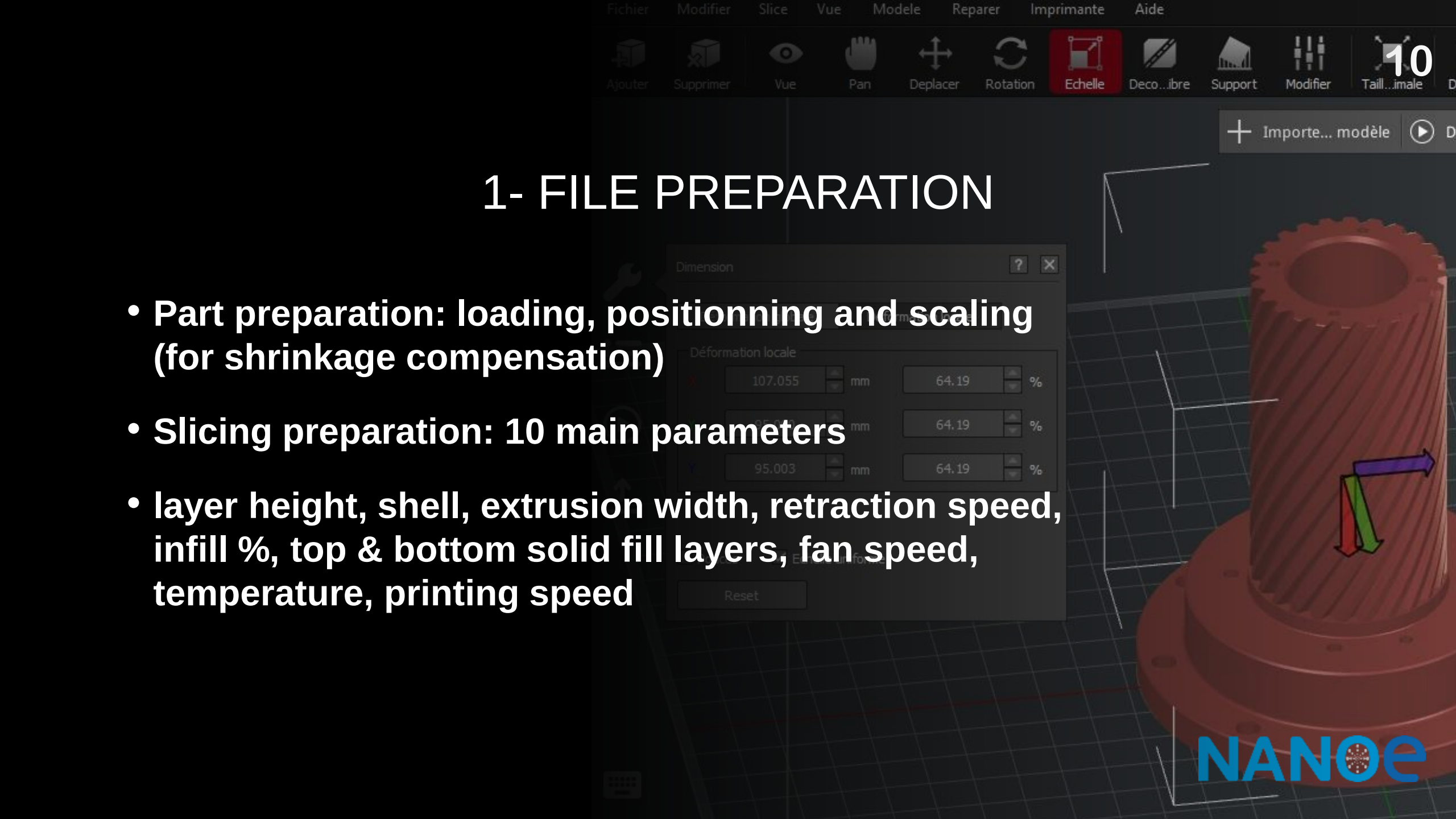
Post processing

6

Rotary tumbling
Polishing

1- FILE PREPARATION

- **Part preparation: loading, positionning and scaling (for shrinkage compensation)**
- **Slicing preparation: 10 main parameters**
- **layer height, shell, extrusion width, retraction speed, infill %, top & bottom solid fill layers, fan speed, temperature, printing speed**

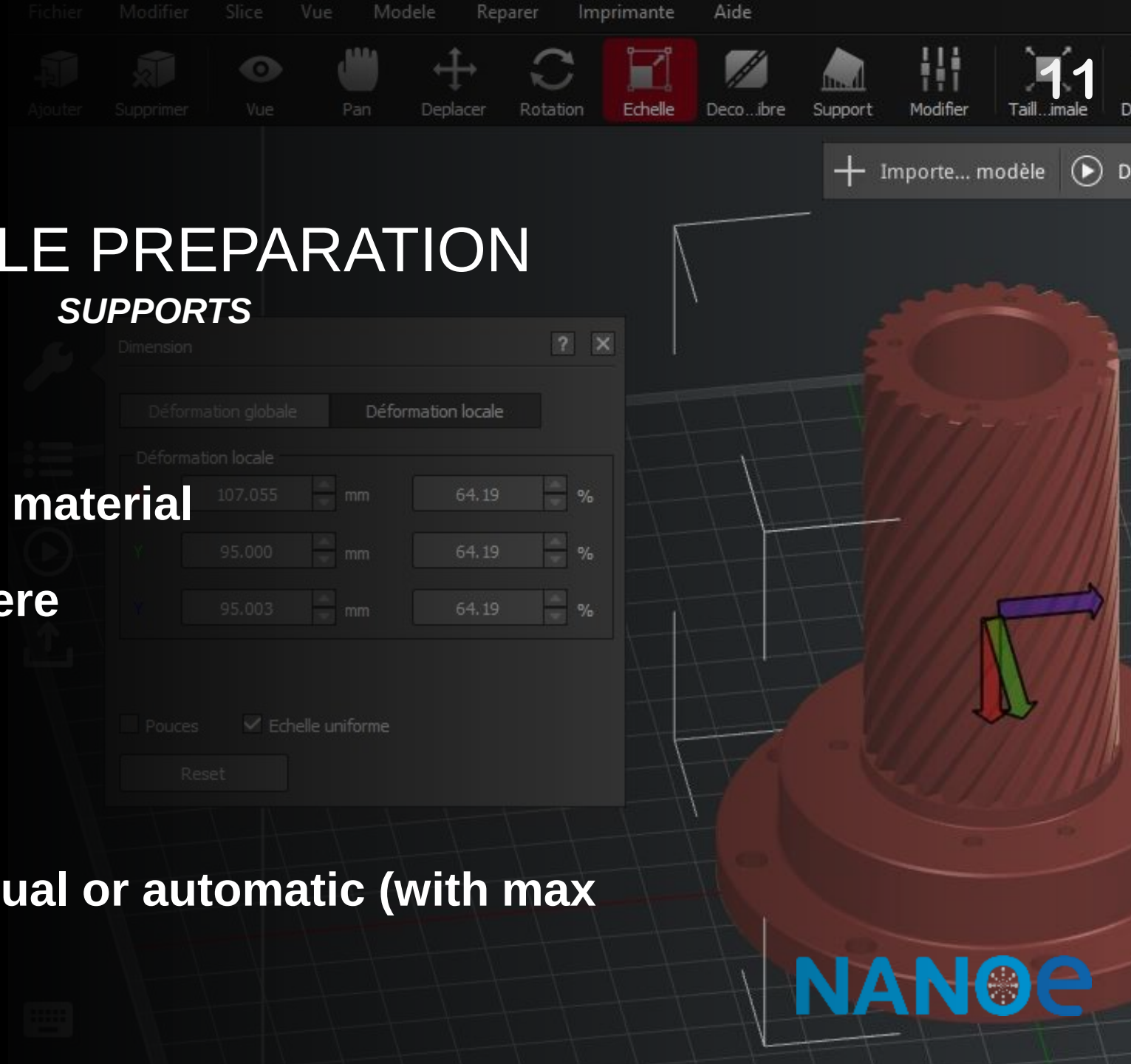


1- FILE PREPARATION

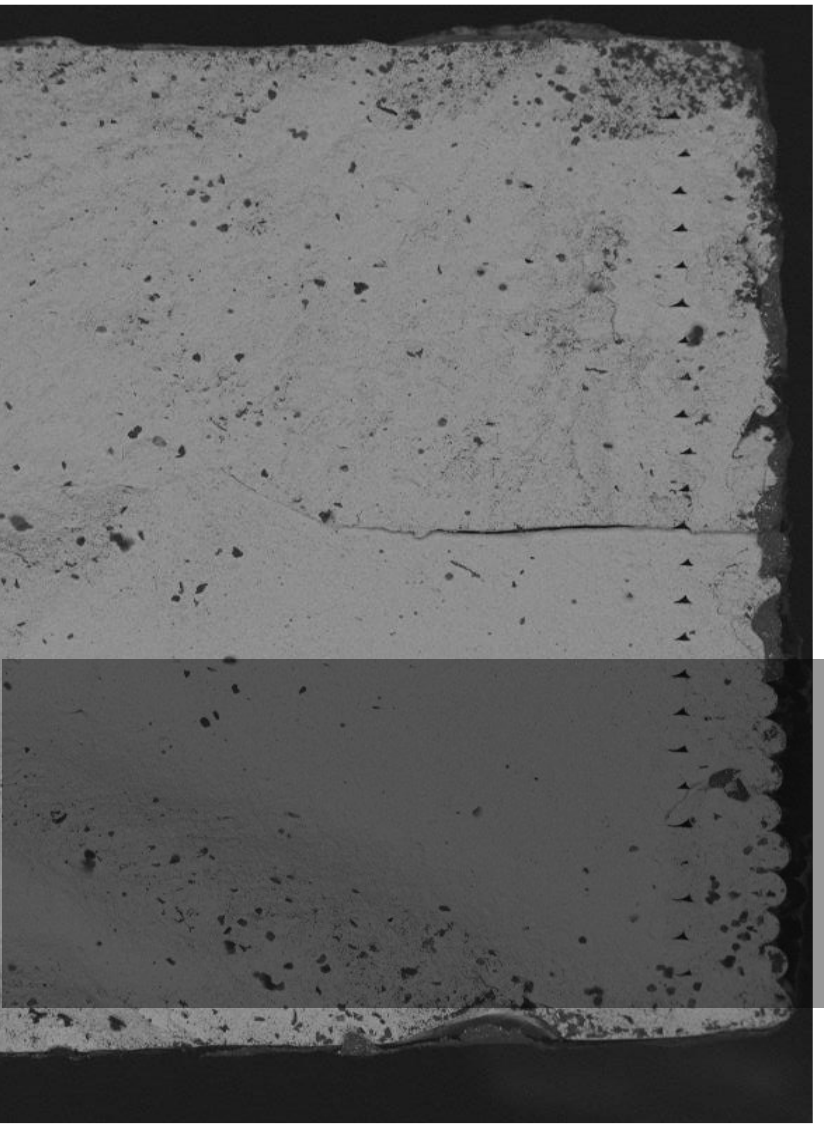
SUPPORTS

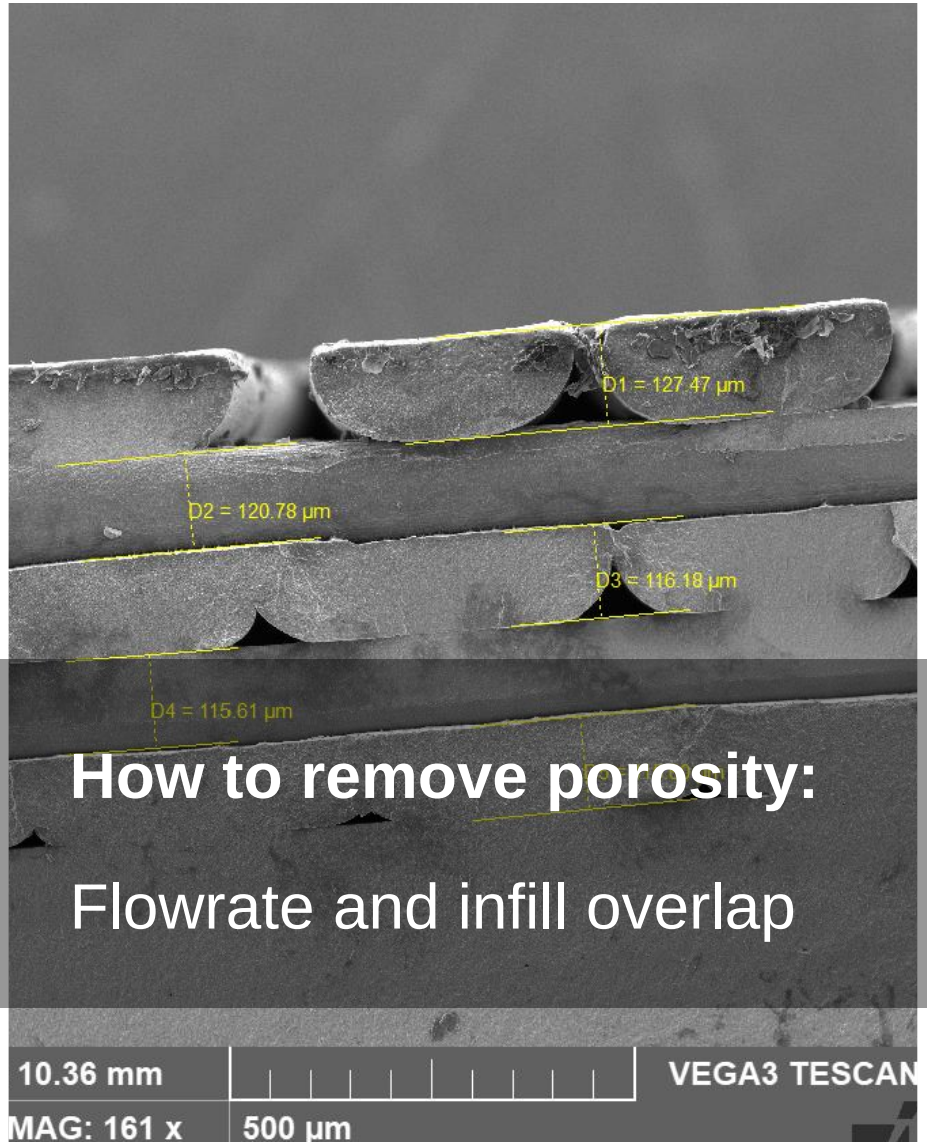
- **Support strategies:**
- **Same material or second material**
- **Plate – piece or everywhere**
- **Colomn, lines, grids**

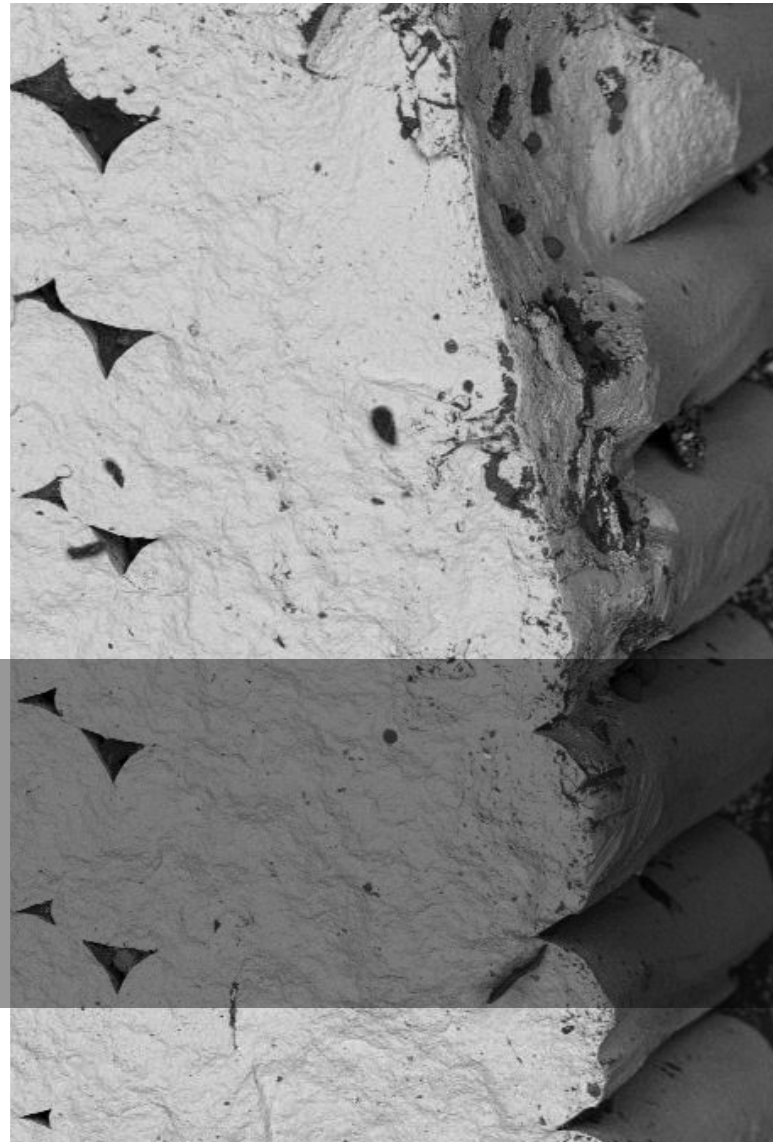
- **Support generation: manual or automatic (with max overhand angle)**



1- FILE OPTIMISATION







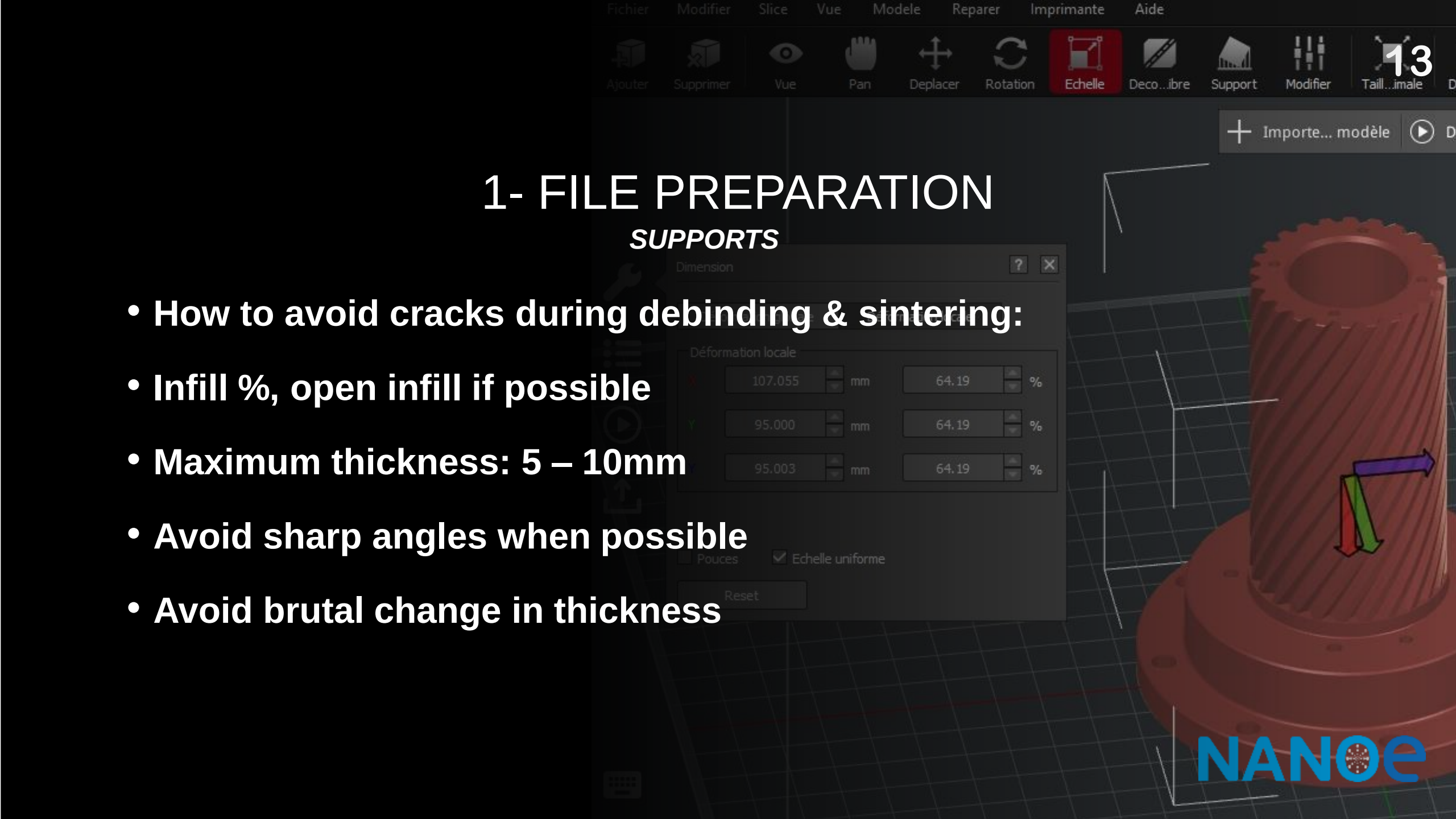
How to remove porosity:

Flowrate and infill overlap

1- FILE PREPARATION

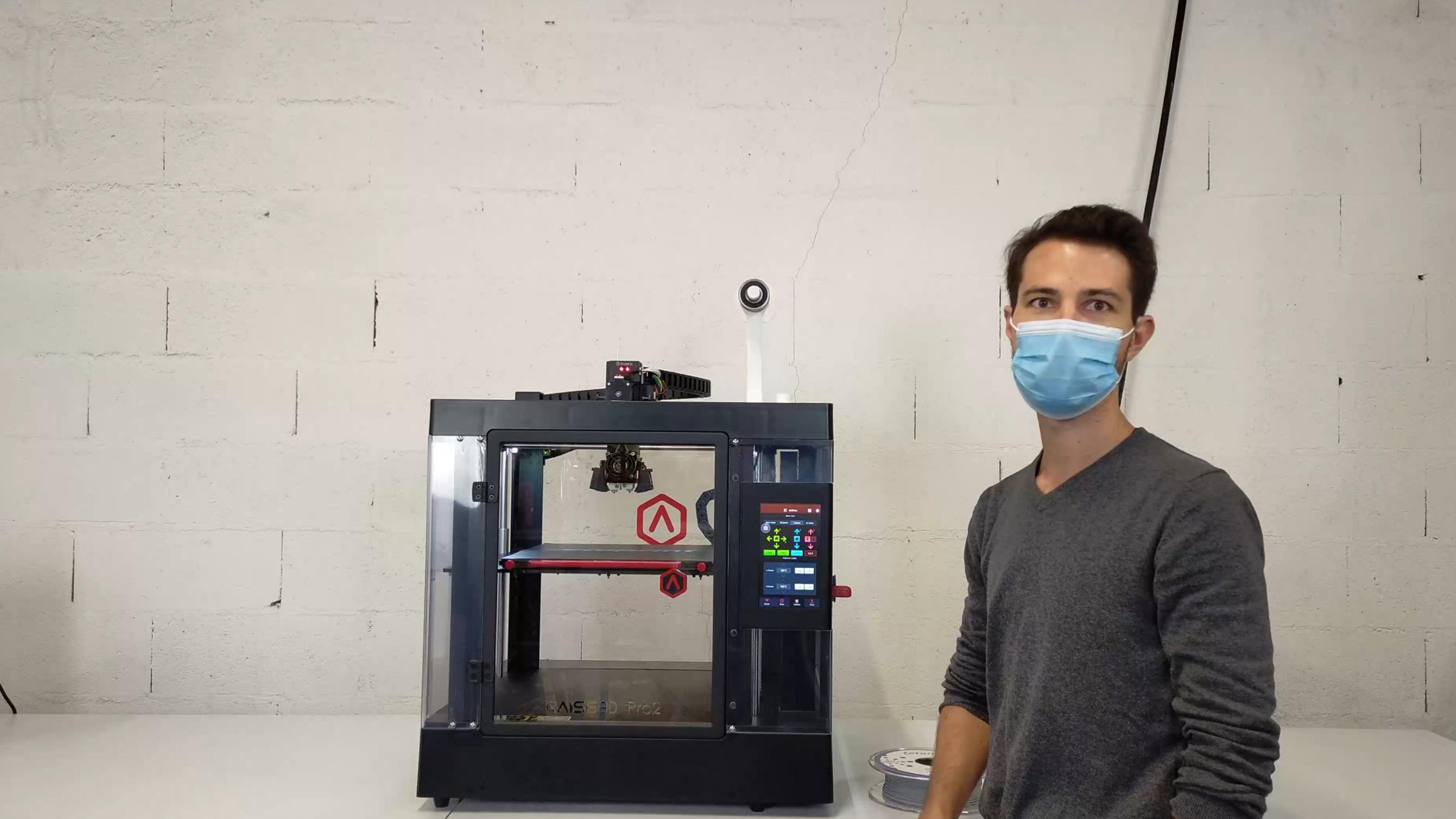
SUPPORTS

- **How to avoid cracks during debinding & sintering:**
- **Infill %, open infill if possible**
- **Maximum thickness: 5 – 10mm**
- **Avoid sharp angles when possible**
- **Avoid brutal change in thickness**



2- PRINTING

- **Print preparation:** Z level check, filament loading, launching the print


RAISE3D Pro2

2- PRINTING

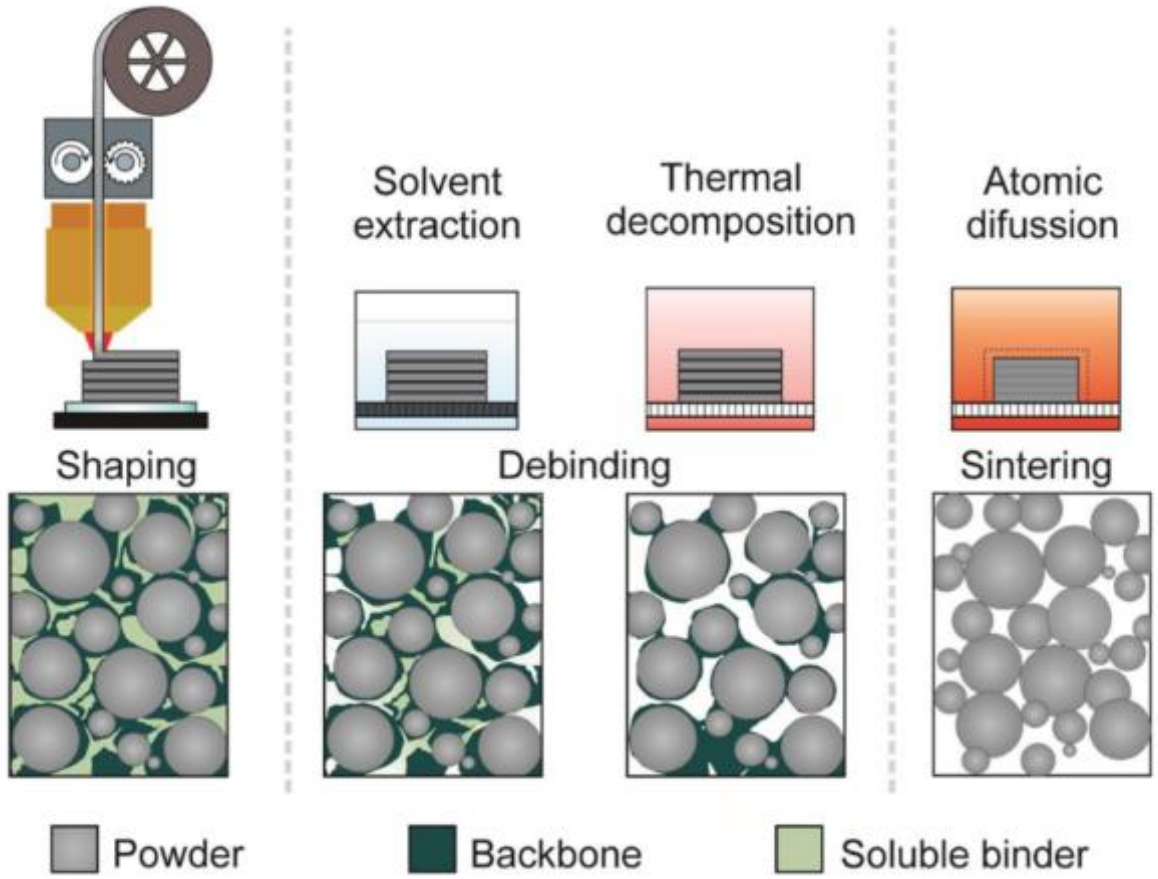
- **Print removal:** plate removal, support removal, manual finish (if necessary)


RAISE
Delete
File name: 19-08-BAGUE ZETA 28mmexport.gcode
Date Modified: 2020/08/19 09:25
Size: 2.5 MB
Template: ZETAMIX ZIRCONIA NOIR-export
Layer height: 0.11 mm
Shell width: 1 mm
Infill: 100 %
Infill speed: 35 mm/s
Estimated print time: 1h 27m
Estimated filament used: 3.8 g
More Details
Print
Cancel

2- PRINTING

- **Troubleshooting: main problems during printing are nozzle clogging or filament jaming in the extruder**

3- DEBINDING


Solvent extraction
Thermal decomposition
Atomic difussion
Shaping
Debinding
Sintering
Powder
Backbone
Soluble binder

3-DEBINDING

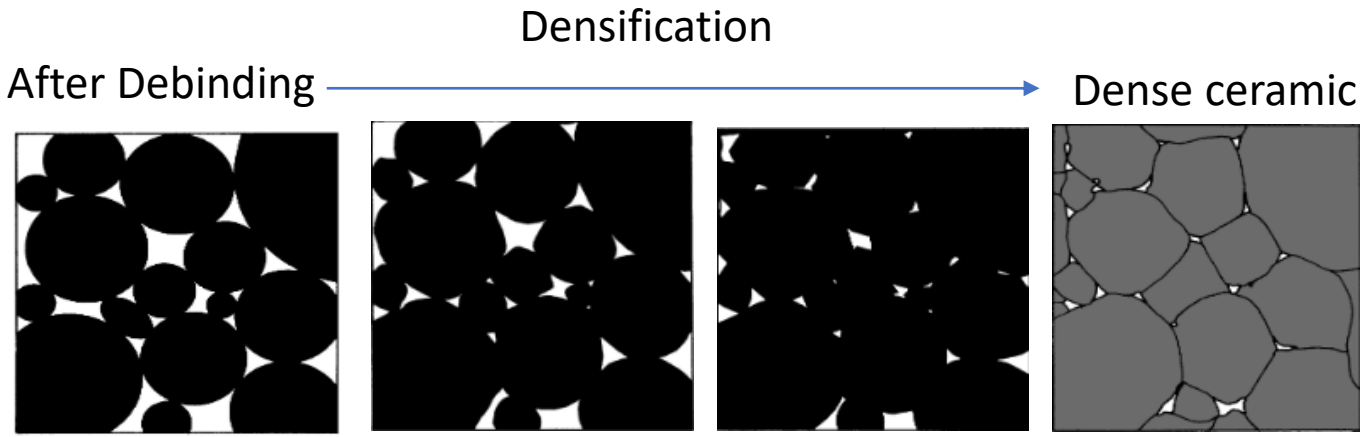
- **Acetone debinding:** heated acetone bath

Check mass loss after debinding (compare with guidelines)


DK SONIC
ULTRASONIC CLEANER

4- SINTERING

- **Density after sintering:** 99% for ceramics, 90 to 95% for metal
- **Shrinkage:** going from 50 – 60 % density to 90 – 99% density implies a linear shrinkage of 15 – 20%



4- SINTERING

- **Furnace:** tube or chamber furnace
- **Sintering temperature:** 1400 – 1600°C
- **Sintering atmosphere:** air for ceramics, Ar/H2 for metal


Sinter
StoP

5- FINISHING

- **Polishing methods:**
  manual or tumbling

Key benefits of Zetamix

Easy-to-use System

Training time is 1 day before you print good parts

Can be used by any trained technician

Very little QSE issues (no volatile powders or toxic materials)

Investment cost are low

Optimized two head 3d printer, debinding kit and atmosphere furnace

Starting, training and user guideline for each material are provided

10k€

Versatility

Compatible with a wide range of materials currently available (Alumina, zirconia, black zirconia, stainless steel) and in development (SiC, WC-Co, Si3N4…)

Good accuracy

Accuracy after sintering is **+- 0.1mm** (for parts up to 80mm)

Possibility to print **closed porosities** and **hollow structures**