The leading ceramic additive manufacturer
Leader in ceramic 3D printing

3DCeram takes benefit of a unique know-how and develops leading solutions for ceramic 3D:

- **CERAMAKER printing lines** and associated services,
- **3DMIX ceramic pastes** dedicated to CERAMAKER printers and on demand formulation,
- **On demand production.**
Global presence, world wide distribution

Direct distribution
Distributors (partners)
Représentatives
JV (China)
Scientific environment

3DCeram is located in Limoges at the heart of scientific ceramic know how:
- CNRS, technical centers,
- About 150 scientists and PHD working on ceramic,
- Engineer schools
Global solutions for 3D printing

Solutions dedicated to ceramic additive manufacturing
Solutions to you additive manufacturing needs

- CERAMAKER 3D printing production line
- 3DMIX, ceramic feedstock
- On demand 3D printing production service
3DMIX: ceramics feedstock for 3D printing

**Ceramic pastes dedicated to CERAMAKER printers**
- Alumina
- Zirconia
- Hydroxyapatite

**3DMIX on demand**
- Paste developed with customer ceramic
- Definition of printing parameters
- Definition of firing parameters
CERAMAKER: 3D printing line

CERAMAKER: industrial printers and process equipment

- Open system
- Ceramaker 100
  - Ceramaker 900
- CeraKlean System
- Kilns
- Post process equipment

Dedicated services

- Online assistance.
- Training, on site services, trouble shooting
## Technical Data CERAMAKER C900 / C100

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions</strong></td>
<td>1000 x 2200 x 1900 mm (WxDxH)</td>
</tr>
<tr>
<td><strong>Tank surface</strong></td>
<td>300<em>300 configurable, 100 mm / 100</em>100*100 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1450 kg</td>
</tr>
<tr>
<td><strong>Electrical requirements</strong></td>
<td>220-240 VAC / 50 Hz</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>2kW</td>
</tr>
<tr>
<td><strong>Laser</strong></td>
<td>Industrial Diode Pump Solid State laser (DPSS)</td>
</tr>
<tr>
<td><strong>Laser size</strong></td>
<td>~30 µm</td>
</tr>
<tr>
<td><strong>Wavelength UV</strong></td>
<td>355 nm / 405 nm</td>
</tr>
<tr>
<td><strong>Layer thickness</strong></td>
<td>0.010 – 0.125 mm</td>
</tr>
<tr>
<td><strong>Operating temperature environment</strong></td>
<td>20-25 °C</td>
</tr>
<tr>
<td><strong>Temperature variation</strong></td>
<td>1°C/hour</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>50 %</td>
</tr>
</tbody>
</table>
A break through technology

Stereolithography applied to advanced ceramic
Ceramic additive manufacturing technology

 adapté to any shape, even complex

 adapté shorter development time

 adapté no tooling

 adapté unique part or short series production

 adapté same properties as parts produced using traditional technologies
Ceramic 3D printing process

Two steps process: printing and firing

CERAMAKER additive manufacturing line
SLA process

1. Preprocess:
   - Creation of the CAD
   - Export to STL file and slicing

2. Printing layer by layer.

3. Post process
   - Debinding and sintering (shrinkage)
   - Final process
Free Link Support (FLS)

- With 3DCeram’s technology, the support is NOT attached to the parts.
- Traditional support technology: hardly removable connections between parts and support.
Debinding and sintering: about 20% shrinkage
Post process

- Tumbling
- Grinding
- CNC machine
On demand production
Additive manufacturing service
Biomedical, industry and luxury markets
Applications

Aerospace

Biomedical
Bone substitute and implants

Energy

Luxury
Bone substitute and implants
Applications

Aerospace

Energy

Biomedical

Bone substitute and implants

Luxury

Bone substitute and implants
OPTICERAM: design for additive manufacturing

- Light Weight
- High mechanical resistance
- Several functions included
- Low CTE
- Easy post assembly

Honeycomb structure with semi close back reinforcement

(OPTICERAM: a partnership between 3DCERAM and OSE company)
OPTICERAM: design for additive manufacturing

336 cm³ in 43h
(6.4x17.8x11.5 cm)
Aerospace
Applications

Aerospace

Energy

Biomedical
Bone substitute and implants

Luxury
Bone substitute and implants
Aircraft industry
Energy

\[
\begin{align*}
\text{CH}_4 + \text{H}_2\text{O} & \rightarrow \text{CO} + 3\text{H}_2 \\
\text{CO} + \text{H}_2\text{O} & \rightarrow \text{CO}_2 + \text{H}_2 \\
\end{align*}
\]

Catalyseur: Nickel sur spinelle (MgAl}_2O}_4

- Réaction globalement endothermique
- Température de réaction > 850°C
- Pression > 20 bars
- Temps de contact > 1 s

Diagram showing the process of gas conversion with a catalyst, including cracking and recombination of gas molecules at high temperature on the catalyst.
Fuel cell H2020 Cell3Ditor

Honeycomb for catalyst applications
Applications

Open up new possibilities!

Multi function

Multi material
Electronic / Fuel cell
Multi-function applications: wafer support

- Light Weight
- High mechanical resistance
- Several functions included
- Low CTE
- Easy post assembly
Multi-function applications: zirconia pump

Made of 17 parts
Multi-function applications: zirconia pump

Made of 17 parts that fit together
Applications

- Aerospace
- Energy
- Biomedical
  Bone substitute and implants
- Luxury
  Bone substitute and implants
Biomedical: applications
Biomedical: implants

Porous and dense areas combined on the same implant
Age: 27 years
Sex: Male
Surgery date: 07/01/2005
Surgery duration: 180 min
Implant surface: 7 x 5 cm
Implant thickness: 5 mm
Fixation holes: 4
Topography: Orbitofrontal
Age : 76 years
Sex : Male
Surgery date : 15/03/2013
Implant surface : 106cm²
Implant thickness : 5mm
Fixation holes : 12
Topography : Frontal
Biomedical: clinical case

Age: 59 years
Sex: Female
Surgery date: 15/02/2013
Implant surface: 150 cm²
Implant thickness: 5 mm
Fixation holes: 12
Topography: Orbitofrontal
Biomedical: bone Substitutes

> 10,000 pieces/year
Applications

Aerospace

Energy

Biomedical

Bone substitute and implants

Luxury

Bone substitute and implants
Luxury: applications
Luxury: free design

Ceramic ring
Ivory, black and pink roses

About 5mm

Möbius ribbon

DNA design
Luxury: free design
Luxury colors: enamel

Traditional enamel applied by hand
- High precision
- High resistance
- Choice of colors

Craftsmanship
Luxury texture and finishing

High gloss

Scanned texture
(3D scan of a wood part for a ring)

Mat

Quilted
Merci!

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