The AdmaPrint Materials

The AdmaPrint feedstock is specially formulated with a mixture of photosensitive resins and a solid load of powder (ceramic or metal), called slurry. The use of light curing and slurries allows achieving high resolutions and very fine surface roughness in printed products. Also, it prevents health hazards and (cross)contamination related to the use of dry powders. The AdmaPrint feedstocks can be used to print complex geometries, large and fine structures resulting in a wide variety of functional products.
Why Digital Light Processing (DLP)?

Digital Light Processing, or DLP, is a printing technique known for its ability to print fine features with a high resolution and low surface roughness.

Compared with most other 3D printing techniques, where the part is heated up locally, the sintering at a uniform high temperature offers more isotropic properties and a more homogeneous microstructure.

DLP 3D printing with ceramics and metals offer high-performance materials with densities of more than 99%. The SEM pictures show the good shape retention, straight corners and regular microstructure of the sintered parts. In most cases, postprocessing is not needed, as the surface finish is very smooth.
The unique capabilities of advanced technical ceramics

Advanced ceramics combine high-performance properties for demanding applications. Ceramics are hard inorganic, non-metallic materials with an impressive capability to hold their excellent mechanical, chemical, electrical properties and thermal wear resistances under extreme environments.
Alumina (Al₂O₃) is one of the most commonly used ceramics in high-tech applications because of its wear resistance and its high chemical and temperature stability. Alumina finds applications in water purification, insulators, semiconductor components, and medical implants. The AdmaPrint A130, Admatec’s alumina recipe, delivers components with high density (> 99%) and smooth surfaces (Ra = 0.3-3 µm).

PROPERTIES
High hardness
High electrical resistance
Refractoriness

APPLICATIONS
Semiconductors and electronics
Medical implants
Valves and pumps
With superior mechanical properties, zirconia (ZrO₂) presents high flexural strength and fracture resistance. Also, zirconia shows very low thermal conductivity, high chemical inertness, and biocompatibility. Among the applications of zirconia, we can find dental restorations, thermal barrier coatings, and jewelry. The AdmaPrint Z130, Admatec’s zirconia recipe, delivers mechanically strong products with high definition.

**PROPERTIES**
- Low thermal conductivity
- High electrical resistance
- High toughness

**APPLICATIONS**
- Extrusion dies
- Bearings
- Jewelry
Silica (SiO₂) is well known for its thermal shock resistance and leachability (chemical dissolution). For these reasons, it is commonly used for the production of shells and cores in investment casting for aerospace and energy applications. The AdmaPrint S130, Admatec’s silica-based recipe, delivers mechanically strong shells with excellent surface properties.

**PROPERTIES**
- High thermal shock resistance
- Chemical and mechanical leachability

**APPLICATIONS**
- High precision casting
- Refractories
Hydroxyapatite

Hydroxyapatite is a naturally occurring mineral, the main element of bones and teeth. Hydroxyapatite is very well-suited to use as a precursor in biomedical applications such as bone replacement and dental implants. Additive manufacturing brings the form freedom capabilities that allow the personalization of medical implants. Admatec produces the AdmaPrint B130 feedstocks that can generate porous yet strong products necessary in implantology.

PROPERTIES

- Biocompatible

APPLICATIONS

- Bone grafting
- Dental prosthetics and repair
Stainless Steel 316L

Alloy 316L is molybdenum-bearing austenitic stainless steel, allowing for good overall resistance to corrosion. 316L is known for its outstanding formability and weldability and offers long-lasting high quality with outstanding elevated temperature tensile. It is robust towards environmental influences, immune for sensitization and a tough material used for weight-bearing duties. Applications typical for 316L are for use in construction and marine projects.

PROPERTIES
- High corrosion resistance
- High toughness
- Non-magnetizable

APPLICATIONS
- Watches, decorative parts
- Medical devices
- Food processing equipment
Stainless Steel 17-4 PH

17-4 PH is a martensitic precipitation-hardening stainless steel providing an excellent combination of high strength, good corrosion resistance, and fine mechanical properties at temperatures up to 315°C. Of all the precipitation-hardening stainless steels, 17-4 PH is the most widely used, as a result of its valuable combination of properties. These properties provide the opportunity to add reliability while reducing costs and simplifying fabrication; an effective solution to many design and production problems. Applications for this metal can be found in aerospace and chemical equipment.

PROPERTIES

High strength
High hardness
Excellent corrosion resistance

APPLICATIONS

Mechanical engineering
Automotive
Aviation and maritime
Inconel 625 is well-known for its versatile properties. The alloy mixture of nickel, chromium, and molybdenum makes it a very strong material, and resistant to elevated temperatures. Inconel 625’s properties, such as high corrosion fatigue strength, high tensile strength, and resistance to chloride-ion stress-corrosion cracking, making it an outstanding choice for sea-water applications. Broad acceptance can also be found in chemical processing as this alloy has a versatile corrosion resistance under a wide range of temperatures and pressures.

PROPERTIES

- High strength
- High oxidation resistance
- High resistance to severely corrosive environments

APPLICATIONS

- Aerospace
- Automotive
Copper is a soft, extremely ductile metal with a very high electrical and thermal conductivity. It is resistant to corrosion and has low chemical reactivity. Copper nowadays is essential for a variety of domestic, industrial and high-tech applications.

**PROPERTIES**
- High thermal conductivity
- Corrosion resistance in humid environments and sea-water
- High electrical conductivity

**APPLICATIONS**
- Heat transfer applications
- Induction heat coils
- Radiofrequency Cathode
### TECHNICAL DATASHEET

<table>
<thead>
<tr>
<th>Property</th>
<th>A12O3</th>
<th>ZRO2</th>
<th>316L</th>
<th>17-4 PH</th>
<th>INCONEL</th>
<th>COPPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (g/cm³)</td>
<td>3.9</td>
<td>6.06</td>
<td>8.04</td>
<td>7.81</td>
<td>8.4</td>
<td>8.75</td>
</tr>
<tr>
<td>Young’s modulus (GPa)</td>
<td>360</td>
<td>210</td>
<td>190</td>
<td>190</td>
<td>205</td>
<td>130</td>
</tr>
<tr>
<td>Bending strength (MPa)</td>
<td>400</td>
<td>600-1000</td>
<td>510</td>
<td>1100</td>
<td>1100</td>
<td>200</td>
</tr>
<tr>
<td>Fracture toughness (MPa m²/²)</td>
<td>3.5</td>
<td>6-9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vickers hardness (HV)</td>
<td>1600 (HV30)</td>
<td>1200(HV35)</td>
<td>120 (HV10)</td>
<td>370 (HV10)</td>
<td>145-220(HV10)</td>
<td>100(HV10)</td>
</tr>
<tr>
<td>Thermal conductivity W/mK</td>
<td>30</td>
<td>2-3</td>
<td>15.9</td>
<td>14</td>
<td>10</td>
<td>360</td>
</tr>
<tr>
<td>Thermal Expansion coefficient 10⁻6/K</td>
<td>7.8</td>
<td>10</td>
<td>17</td>
<td>10.8</td>
<td>12.8</td>
<td>13</td>
</tr>
<tr>
<td>Electrical resistance Ω/m</td>
<td>1012</td>
<td>108</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The stated values are typical to this type of material, and may vary due to sintering conditions. This is non-contractual data to be used only for reference.