**MATERIAL OVERVIEW**

- An age-hardenable nickel-based superalloy designed specifically for use as feedstock in powder bed fusion. ABD®-900AM is optimised for high creep and tensile strength, and corrosion/oxidation resistance, with a working temperature range up to 900°C in its age-hardened state.
- The new alloy has excellent creep strength – similar to alloy 939 and Ni 738 – while having superior resistance to cracking during manufacture and heat treatment.

Designed to be free of solidification, liquidation and strain-age cracks, ABD®-900AM is 40% γ′ phase and showcases exceptional printability for such a high temperature strengthened alloy. It is suitable for complex components within the Aerospace, Power, Automotive and Space industries.

**KEY PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical(^1,2) (900°C)</td>
<td></td>
</tr>
<tr>
<td>Yield strength (MPa)</td>
<td>z 574</td>
</tr>
<tr>
<td></td>
<td>xy 568</td>
</tr>
<tr>
<td>Ultimate tensile strength (MPa)</td>
<td>z 582</td>
</tr>
<tr>
<td></td>
<td>xy 593</td>
</tr>
<tr>
<td>Elongation at failure %</td>
<td>z 13</td>
</tr>
<tr>
<td></td>
<td>xy 7</td>
</tr>
<tr>
<td>Area reduction at failure %</td>
<td>z 12</td>
</tr>
<tr>
<td></td>
<td>xy 7</td>
</tr>
<tr>
<td>Thermo-physical(^3) (25-1200°C)</td>
<td></td>
</tr>
<tr>
<td>Thermal conductivity (W(m°C(^{-1})))</td>
<td>11.0 - 30.1</td>
</tr>
<tr>
<td>CTE (Linear)/x10-6°C(^{-1})</td>
<td>11.4 - 19.2</td>
</tr>
<tr>
<td>Physical(^4)</td>
<td></td>
</tr>
<tr>
<td>Density/ g cm(^{-3})</td>
<td>8.395</td>
</tr>
<tr>
<td>Melting range/ °C</td>
<td>1305-1380</td>
</tr>
</tbody>
</table>

\(^1\)strain rate of 10\(^{-3}\) s\(^{-1}\), \(^2\)after recrystallisation anneal and full heat treatment, \(^3\)after full heat treatment, \(^4\)as-printed

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**PRINTABILITY**

ABD®-900AM shows high part density and no cracking when printed with standard Ni 718 parameters.

**POWDER CHARACTERISTICS**

Particle size distributions:

- Laser Beam Melting (powder bed): 15-53 μm
- Electron Beam Melting (powder bed): 45-106 μm
- Directed energy deposition (LMD): 45-106 μm
- Custom size distributions available on request

ABD®-900AM is well suited for gas atomisation

ABD®-900AM is available in batch sizes suitable for R&T and full production.

Contact: powder@eramet.com
www.aubertduval.com
TENSILE PROPERTIES

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Tensile properties of additively manufactured ABD®-900AM and Ni718, evaluated at a strain rate of 10^{-3}s^{-1}, all other test conditions in accordance to ASTM E8/E8M-16a/E21. No HIP applied. Yield Strength (YS) shown is Rp_{0.2} stress, Ultimate

TENSILE DUCTILITY & REDUCTION OF AREA

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LONG TERM STABILITY

Tensile properties of additively manufactured ABD®-900AM after full heat treatment cycle followed by long term heat exposure. Yield strength evaluated at 650 °C with a strain rate of 10⁻⁴ s⁻¹. Data for Alloy 718 and Alloy 718Plus taken from “Advanced Materials and Processes, December 2006”

FATIGUE PROPERTIES

Low cycle fatigue properties of additively manufactured ABD®-900AM after full heat treatment cycle. Tested in accordance to ASTM E606.

STRESS RUPTURE PROPERTIES

Stress rupture properties of additively manufactured ABD®-900AM after recrystallisation anneal and full heat treatment cycle. Tested in accordance to ASTM E139. Larson-Miller Parameter evaluated with Temperature (T) in Kelvin and Time (t) in hours. Ni718 is additively manufactured and fully heat treated.
**THERMOPHYSICAL PROPERTIES**

Linear coefficient of thermal expansion measured according to ASTM E228. Average of heating and cooling curves.\(^1\)

Thermal conductivity ($\kappa$) of ABD®-900AM is calculated according to ASTM standards from measured values of density ($\rho$), specific heat capacity ($C_p$), and thermal diffusivity ($\alpha$): $\kappa = \rho C_p \alpha$.\(^1\)

\(^1\)ABD®-900AM after full heat treatment, \(^2\)ABD®-900AM in an as-printed condition

**MICROSTRUCTURE & HEAT TREATMENT**

**Full heat treatment:** 1060°C/2hrs + 850°C/4 hrs + 760°C/16 hrs

**Recrystallisation anneal:** 1240°C/2hrs, followed by full heat treatment

**HIP parameter:** 1160°C/100 MPa / 3 hrs

Typical EBSD maps and grain structures of ABD®-900AM after the corresponding heat treatments.

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