AUBERT&DUVAL

Pearl®Micro 420

Powder for Additive Manufacturing

PEARL Micro

CHEMICAL COMPOSITION

Elements	Fe	Cr	Mn	Si	Ni	Co	P	S	C	N	O*
Min	Bal	12	-	-	-	-	-	-	0,35	-	-
Max	-	14	1	1	<0,1	<0,1	0,04	0,03	0,4	0,1	0,04

*O level valid for 20-53μm size, finer powder fractions will have higher oxygen content.

STANDARDS

- European standards
  - X40Cr13
  - 1.2083
  - Z38C13
- US Standards
  - S42000

MATERIAL OVERVIEW

Pearl®Micro 420 is a martensitic stainless tool steel suitable for additive manufacturing of plastic injection mold inserts and general engineering parts. The main benefits with Pearl®Micro 420 compared to the maraging steels are:

- Pearl®Micro 420 is a Cobalt and Nickel free. This is important as cobalt is considered as cancerogenic if inhaled and Nickel is allergenic.
- Pearl®Micro 420 is stainless which will facilitate maintain the cooling channels open.
- Pearl®Micro 420 has a higher impact toughness. It will be less sensitive to handling damages.
- Pearl®Micro 420 reach the appropriate hardness for plastic injection molds.
- Pearl®Micro 420 is a generic non-proprietary grade but manufactured with ESH technology ensuring high powder cleanliness.

PRINTABILITY

We recommend preheating of the base plate when printing Pearl®Micro 420. To reduce the thermal stresses the laser scanning speed can be increased.

PHYSICAL PROPERTIES

Property	Unit	20°C	200°C
Density	g/cm^3	7.7	7.7
Thermal conductivity	W/(m*K)	20	21
Specific heat	J/(kg*K)	460	-
Thermal expansion	10^{-6} K^{-1}	-	11.4
Young modulus	GPa	200	

APPLICATIONS

- Inserts for plastic injection molds
- Tool holders
- Mechanical parts

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

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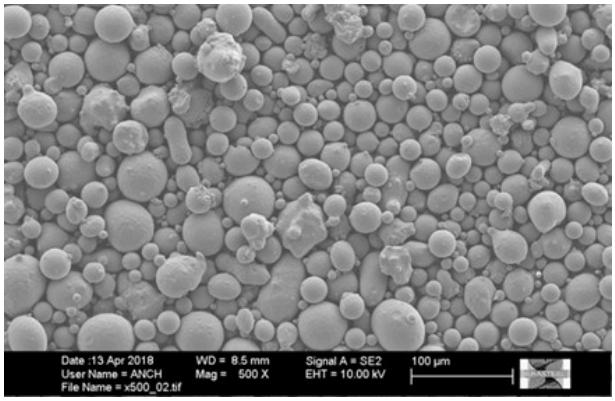
PDS_PearlMicro420_EN_V1_2021

POWDER MORPHOLOGY

Powder for laser bed fusion	Max
+75 µm (ISO 4497)	0.3%
+53 µm (ISO 4497)	7%
-20 µm (ISO 13320)	5%
Powder for laser metal deposition	**Max**
+106 µm (ISO 4497)	0.3%
+90 µm (ISO 4497)	5%
-53 µm (ISO 4497)	7%
-45 µm (ISO 4497)	0.3%



HEAT TREATMENT

There are different heat treatments possible.

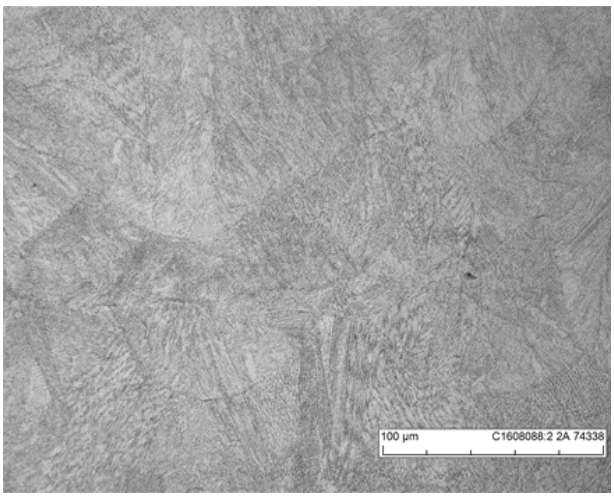
- A simple stress relief at 350-400°C can be used for smaller or simple injection mold inserts.
- A simple stress relief at 580-600°C can be used for mechanical parts.
- Full heat treatment with both quenching and tempering is recommended for larger, more complicated or more solicited parts or inserts.

If quenching is done, heat up with a preheating step and quench in oil or using high pressure gas.

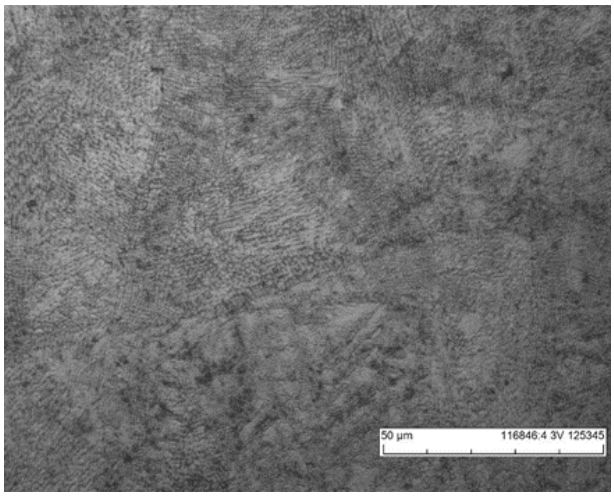
Stress reliving/Tempering by keeping at given temperature for 2 hours. Cool to below 200°C either in the furnace or protected from convection under a hood to not induce new thermal stresses.

Transition temperatures	
A1	800°C
Ms	260°C

MICROSTRUCTURES

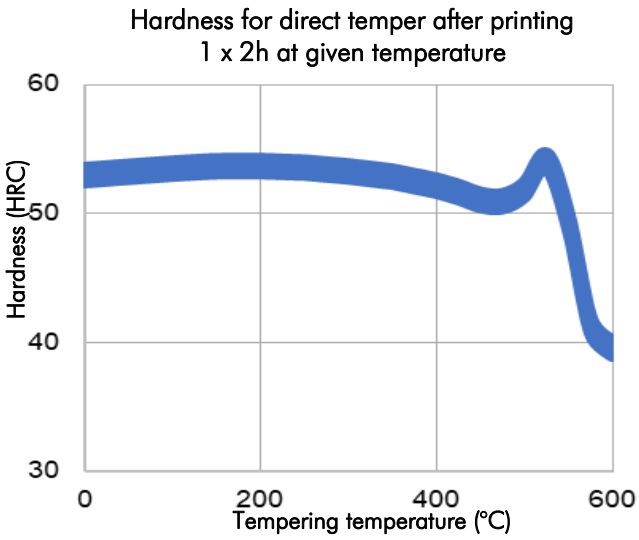


As-built

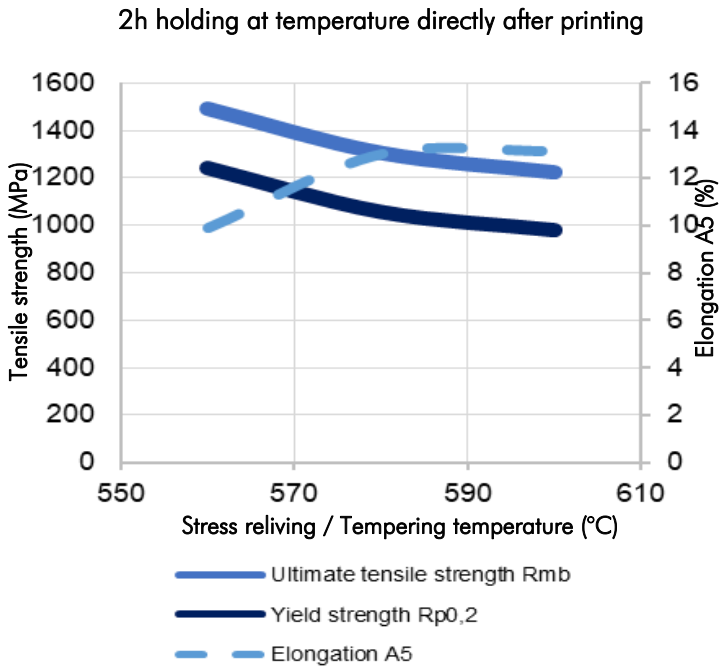


Stress relieved 350°C / 2h

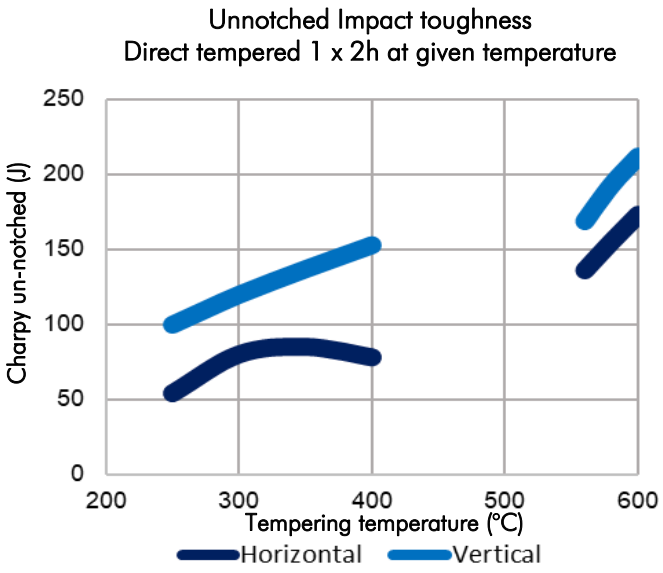
HARDNESS

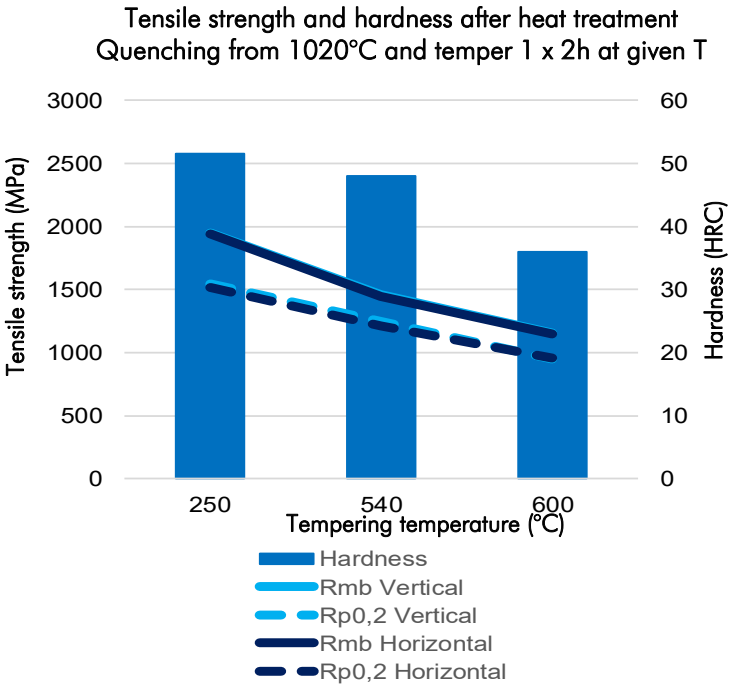


TENSILE PROPERTIES

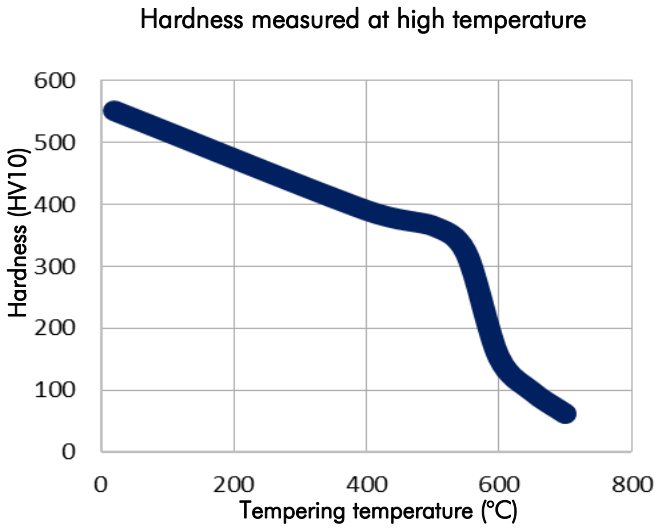


IMPACT TOUGHNESS





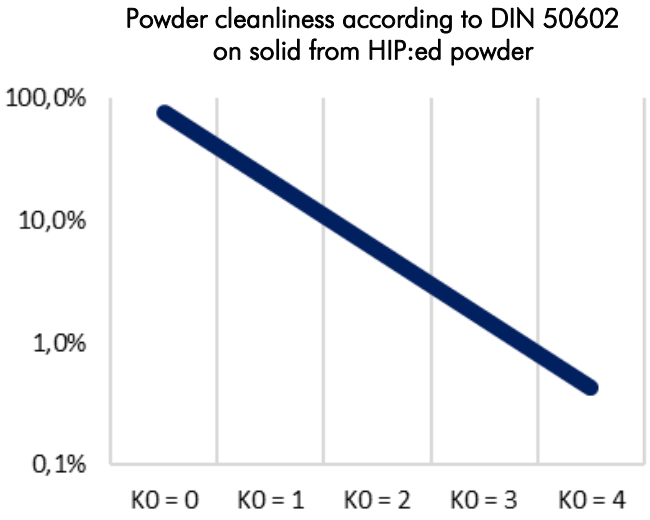
HOT HARDNESS



CLEANLINESS

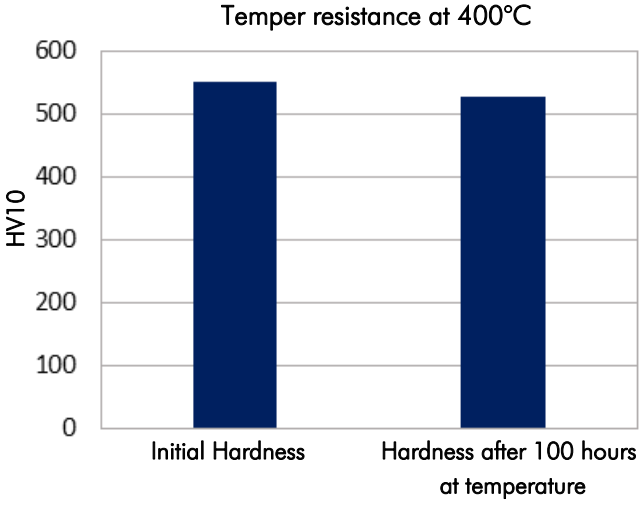
The Electro Slag Heating (ESH) produce a high cleanliness powders. High cleanliness from non-metallic inclusions is important for the fatigue resistance and the polishability.

We perform statistical measurements of the powder cleanliness by HIP of powder samples followed by cleanliness assessment using the DIN 50602 standard with the k0 criteria.



TEMPER RESISTANCE

The temper resistance is the resistance to softening with time at elevated temperatures.



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