Datasheet
Martensitic stainless steel

Osprey® 420

Osprey® 420 is a martensitic stainless chromium steel free of nickel and cobalt with good ductility and high strength and hardness. After hardening, the alloy has good corrosion resistance and high toughness.

UNS
S42000

ASTM, AISI
420

EN Name
X20Cr13

EN Number
1.4021

Powder designed for

Additive Manufacturing (AM)
Metal Injection Moulding (MIM)

Product description

Osprey® 420 is a martensitic stainless chromium steel free of nickel and cobalt, characterized by good ductility and high strength and hardness. After hardening, the alloy has good corrosion resistance and high toughness.

The alloy is available as a standard grade as well as an enhanced grade alloyed Niobium (Nb) and molybdenum (Mo), which are conventionally added to stainless steels to improve their mechanical and corrosion properties. In Laser -Powder Bed Fusion (L-PBF), these additions are also found to improve mechanical performance.

The powder for Metal Injection Moulding (MIM) has material properties that achieve typical values and exceed minimum values, according to MPIF Standard 35.

This metal powder is manufactured by Inert Gas Atomization (IGA), producing a powder with a spherical morphology which provides good flow characteristics and high packing density. In addition, the powder has a low oxygen content and low impurity levels, resulting in a metallurgically clean product with enhanced mechanical performance.

Chemical composition (nominal), %

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Fe	Bal.
C	0.30
Cr	13
Si	≤1.0
Mn	≤1.0
S	≤0.03
P	≤0.04

Powder characteristics and morphology

Powder for Additive Manufacturing

Osprey® metal powder for Additive Manufacturing is characterized by a spherical morphology and high packing density, which confer good flow properties. For powder bed processes these are essential when applying fresh powder layers to the bed to ensure uniform and consistent part build.

For blown powder processes, such as Direct Energy Deposition (DED), good flow ensures uniform build rates. Tight control of the particle size distribution also helps ensure good flowability. Low oxygen powders result in clean microstructures and low inclusion levels in the finished parts.

Powder for Metal Injection Moulding (MIM)

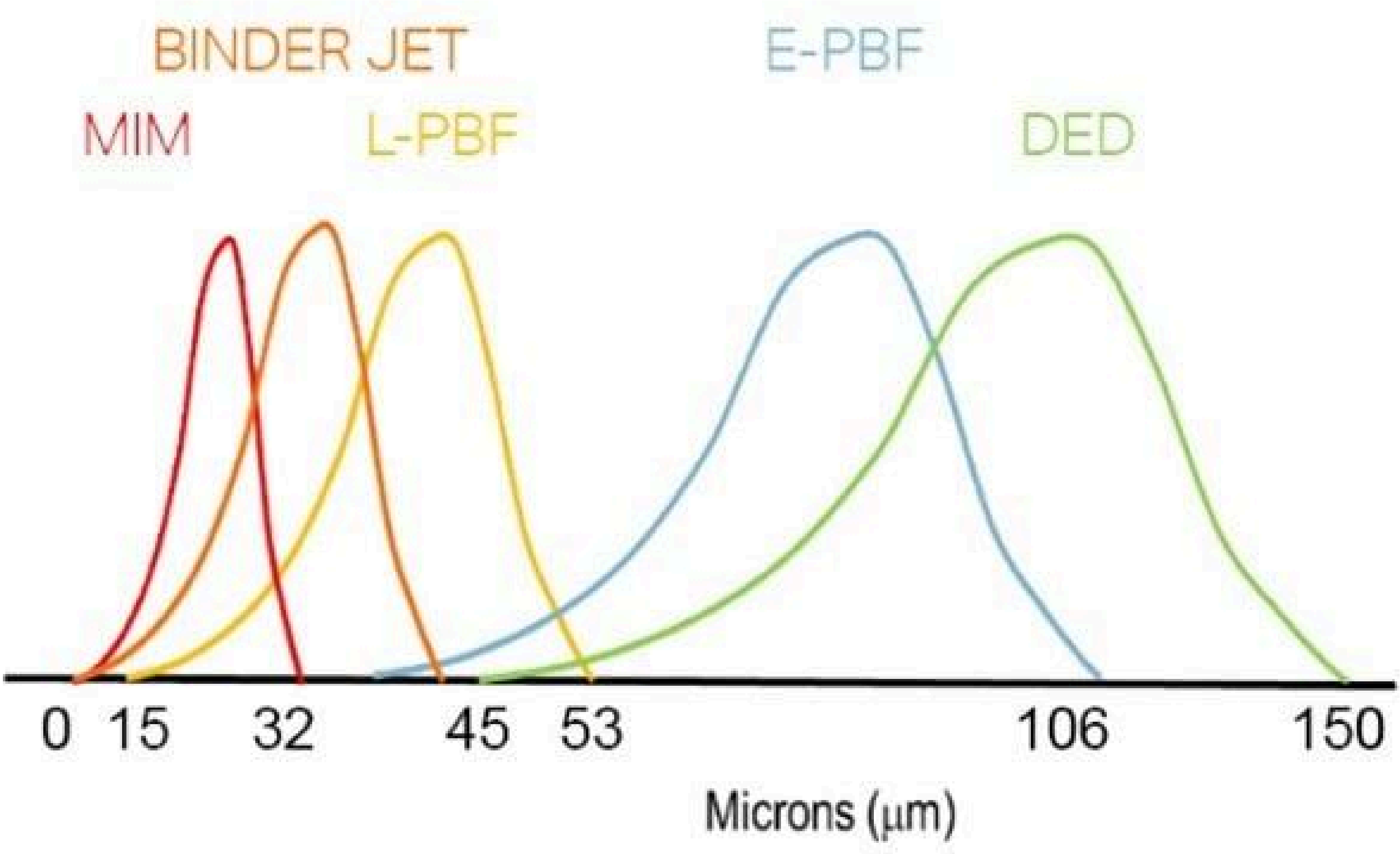
Osprey® MIM powder has a spherical morphology, resulting in high packing density. This enables the manufacture of feedstocks with high powder loading, which not only minimizes binder costs but also reduces part shrinkage during debinding and sintering. Spherical powder also has excellent flow characteristics, resulting in reduced tool wear and consistent mould filling.

Osprey® MIM powder's low oxygen content allows better control of carbon and consistency during sintering. Low oxygen levels, together with high packing density, also facilitate faster sintering.

Particle size distribution

Powder for Additive Manufacturing

Osprey® metal powder for Additive Manufacturing is available in a wide range of particle size distributions that are tailored to the individual Additive Manufacturing systems. They can also be tailored to the particular requirements of the end application, both in terms of mechanical performance and surface finish.



Process technology	Size (μm)
Binder jetting	≤ 16, ≤ 22, ≤ 32, ≤ 38, ≤ 45
Laser - Powder Bed Fusion (L-PBF)	15 to 53 and 10 to 45
Electron beam - Powder Bed Fusion (E-PBF)	45 to 106
Direct Energy Deposition (DED)	53 to 150

Powder for Metal Injection Moulding (MIM)

Osprey® metal powder for Metal Injection Moulding (MIM) is available in a wide range of particle size distributions, from under 5 μm up to 38 μm. The table shows our standard particle size distributions for MIM powders.

Size (μm)	D10 (μm)	D50 (μm)	D90 (μm)
≤ 38	5.5	13.0	31.0
≤ 32	5.0	12.0	29.0
80% ≤ 22	4.5	11.5	27.0
90% ≤ 22	4.0	10.5	22.0
90% ≤ 16	3.5	8.0	16.0

*Particle size measurements performed using a Malvern laser particle size analyzer, typical D10, D50 and D90 provided.

Tailor-made particle size distributions are available on request.Contact us to discuss your specific requirements.

Heat treatment

Components made from Osprey® 420 benefit from a simple heat treatment, which can result in a Transformation Induced Plasticity (TRIP) effect, during loading that significantly increases the elongation.

The alloy can be heat treated to relieve induced stress during the additive manufacturing build process and stabilize the microstructure.

Mechanical properties

Osprey® 420 is suitable for e.g. processing by additive manufacturing including Laser - Powder Bed Fusion (L-PBF), achieving a high density (> 99.8%) when using optimized build conditions and process parameters.

Properties are shown for both standard and optimum grade compositions.

Typical mechanical properties of material produced by Laser - Powder Bed Fusion (L-PBF) in as-built condition, evaluated at room temperature

Grade composition	Yield strength ($R_{p0.2}$), MPa	Tensile strength (R_m), MPa	Elongation (A), %	Hardness, HV (HRC)*
Standard	900	1,050	2.5	640 (55)
Enhanced	1,050	1,340	4.0	570 (52)

Grade composition	Yield strength ($R_{p0.2}$), ksi	Tensile strength (R_m), ksi	Elongation (A), %	Hardness, HV (HRC)*
Standard	131	152	2.5	640 (55)
Enhanced	152	194	4.0	570 (52)

*Typical Vicker's Hardness levels (ASTM E92, ISO 6507-1, JIS Z2244, GB/T 4340.1) as well as HRC values (ASTM E18, ISO 6508-1, JIS Z2245, GB/T 230) in the Laser - Powder Bed Fusion (L-PBF) as-built and heat-treated conditions.

Typical mechanical properties of material produced by Laser - Powder Bed Fusion (L-PBF) in heat-treated condition, 315°C/599°F for 2h followed by air cooling.

Grade composition	Yield strength ($R_{p0.2}$), MPa	Tensile strength (R_m), MPa	Elongation (A), %	Hardness, HRC*
Standard	900	1,520	6.3	53
Enhanced	1,280	1,750	9.0	51
Grade composition	Yield strength ($R_{p0.2}$), ksi	Tensile strength (R_m), ksi	Elongation (A), %	Hardness, HRC*
Standard	138	220	6.3	53
Enhanced	186	254	9.0	51

*Typical Vicker's Hardness levels (ASTM E92, ISO 6507-1, JIS Z2244, GB/T 4340.1) as well as HRC values (ASTM E18, ISO 6508-1, JIS Z2245, GB/T 230) in the Laser - Powder Bed Fusion (L-PBF) as-built and heat-treated conditions.

Typical application areas

Osprey® 420 does not contain nickel or cobalt and therefore provides a cost-effective material, which is suitable for applications that demand high levels of mechanical strength combined with corrosion resistance.

Applications include conformal cooled injection mould tools and medical instruments and knives.

Testing

All Osprey® metal powders are supplied with a certificate of analysis containing information on the chemical composition and particle size distribution. Information on other powder characteristics is available upon request.

Packaging

A wide range of packaging options is available, from 5kgs plastic bottles to 250kg metal drums.

5 kg (11 lbs) Plastic bottles
6 kg (13 lbs) Plastic bottles
10 kg (22 lbs) Plastic bottles
20 kg (44 lbs) Metal cans
100 kg (220 lbs) Steel drums
150 kg (330 lbs) Steel drums
250 kg (551 lbs) Steel drums
All packaging materials are suitable for air, sea and road freight.

Contact us for more information and to discuss your packaging requirements.

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