

Material Product Data Sheet

Nickel Chromium Molybdenum Superalloy Powder for Additive Manufacturing

Powder Products: MetcoAdd™ 6022A

1 Introduction

MetcoAdd 6022A is a nickel-chromium-molybdenum superalloy, similar to UNS N06022 and DIN 2.4602. It exhibits excellent resistance to chemical attack, pitting corrosion, crevice corrosion and stress corrosion cracking. The high chromium and molybdenum content in MetcoAdd 6022A offer improved oxidation and chloride attack resistance compared to other nickel-based superalloys and stainless steels.

MetcoAdd 6022A has been designed for processing in Laser Powder Bed Fusion (PBF-LB). MetcoAdd 6022A has been meticulously engineered and tested to meet the demanding requirements of powder bed additive manufacturing.

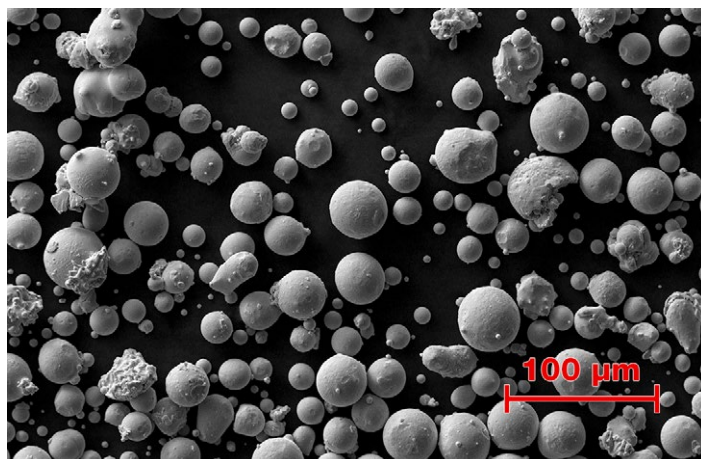
In the printed and heat treated condition, MetcoAdd 6022A has a fully austenitic (face-centered-cubic) structure for excellent ductility and corrosion resistance. As Metco 6022A does not contain any precipitation-formers (e.g., Al, Ti, Nb), structures produced from MetcoAdd 6022A are also essentially free of secondary or precipitation phases. This further contributes to the outstanding corrosion resistance and excellent weldability of the material. A low carbon content ensures very limited of carbide phases within the build.

1.1 Typical Uses and Applications

- Oil and gas equipment
- Industrial processing equipment
- Chemical processing equipment
- Pharamaceutical and biotech processing equipment
- Personal and home care processing equipment (e.g., soaps, detergents, cleaners)
- Foodstuff processing equipment

Quick Facts

| | |
|------------------|----------------------------------|
| Classification | Alloy, nickel-based |
| Chemistry | NiCrMoW |
| Manufacture | Inert gas atomized |
| Morphology | Spheroidal |
| Apparent Density | 4 to 5 g/cm ³ |
| Process | Laser Powder Bed Fusion (PBF-LB) |



Typical cross-section of MetcoAdd 6022A gas-atomized powder with a freely-flowing spheroidal morphology.

2 Material Information

2.1 Chemical Composition

| Product | Weight Percent (nominal) | | | | | | | |
|----------------|--------------------------|----|----|----|---|---------|---------|-------|
| | Ni | Cr | Mo | Fe | W | Co | Mn | Other |
| MetcoAdd 6022A | Balance | 22 | 14 | 3 | 3 | 2.5 max | 0.5 max | < 0.5 |

2.2 Particle Size Distribution

| Product | Nominal Range (µm) | D90 (µm) | D50 (µm) | D10 (µm) |
|----------------|--------------------|----------|----------|----------|
| MetcoAdd 6022A | -53 +20 µm | 50 | 32 | 21 |

Nominal range size analysis 45 µm or above measured by sieve (ASTM B214), analysis below 45 µm by laser diffraction (ASTM C 1070, Microtrac). Fractional analysis (D90, D50, D10) are nominal values by laser diffraction

2.3 Other Properties

| Product | Morphology | Manufacturing Method | Hall Flow (s/500 g) |
|----------------|------------|----------------------|---------------------|
| MetcoAdd 6022A | Spheroidal | Gas Atomized | < 16 |

2.4 Key Selection Criteria

- MetcoAdd 6022A has been engineered specifically for additive manufacture of a wide-range of components using powder bed fusion processing.
- MetcoAdd 6022A offers superior resistance to oxidizing and non-oxidizing chemical attack, pitting corrosion, crevice corrosion, stress corrosion cracking and corrosion in high-chloride environments.
- When compared to other common nickel-based superalloys such as Inconel 625 or Inconel 718 or stainless steels such as grades 316L, 17-4 PH and 15-5 PH, the excellent corrosion resistance of MetcoAdd 6022A makes it the best choice for highly corrosive environments.

2.5 Related Products

- Oerlikon Metco offers several other nickel-based superalloy products for additive manufacturing including, MetcoAdd 718 series, MetcoAdd 625 series and others.
- Oerlikon Metco also offers several steel alloys for additive manufacturing including grades 17-4PH and 15-5PH stainless steel grades 316L type austenitic stainless steel, maraging steels, and tool steels.
- In addition to nickel- and iron-based powders, Oerlikon Metco offers cobalt- and titanium-based materials for additive manufacturing. Please contact your Oerlikon Metco account representative for more information.

2.6 Specifications

| Product | Specifications (similar to) |
|----------------|-----------------------------|
| MetcoAdd 6022A | UNS N06022 DIN 2.4602 |

3 Key Processing Information

3.1 Typical Post Heat Treatment Properties (MetcoAdd 6022A) ^{a, b, c}

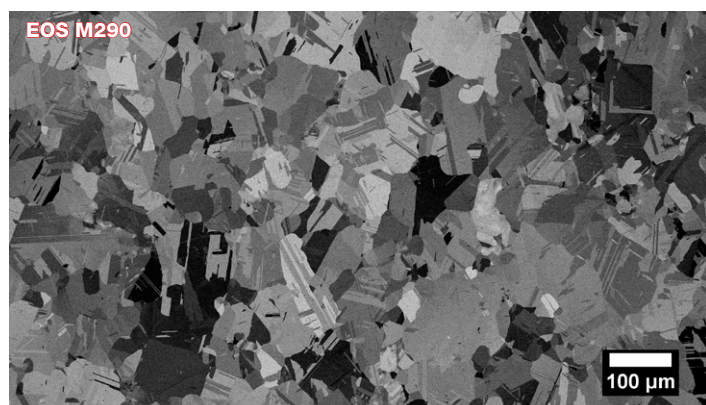
| Specification | | EOS M290 |
|--------------------------------------|------------------------|--------------|
| Ultimate Tensile Strength (MPa) | ASTM E8 | 828.7 ± 2.7 |
| Yield Strength (MPa) | | 378 ± 4 |
| Elongation at break (%) | | 58 ± 1 |
| Modulus of Elasticity (GPa) | | 199.5 ± 22.4 |
| Hardness (VHN ₁₀) | ASTM E384-17 | 190 ± 9 |
| Average Density (g/cm ³) | Internal Specification | 8.70 ± 0.008 |

^a Disclaimer: All data published in this datasheet has been shared for reference purposes only and is not sufficient to design or certify parts. No warranty or guarantee is made against these results.

^b Bounds are based on one standard deviation of each population with six samples in the Z direction. Test specimens were 6.35 mm (0.25 in) diameter round bars machined from coupons 75 x 75 x 13 mm (3 x 3 x 0.5 in).

^c Coupons were HIP processed at a heating rate of 10 °C/min (18 °F/min) and held at a temperature of 1155 ± 10 °C (2111 ± 18 °F) and a pressure of 140 ± 5 MPa (167.5 ± 0.725 kpsi) for 180 ± 30 min.

3.2 Post Heat Treatment Microstructure, Vertical Build Direction (MetcoAdd 6022A)



Homogeneous, fully austenitic microstructure of MetcoAdd 6022A processed via PBF-LB (with the characteristic twinned grains), and free of any grain structure texture.

3.3 Additive Manufacturing Services

Oerlikon AM is an excellent source for pilot and production run additive manufacturing services and is ready to serve your needs. Please contact your Oerlikon Metco account manager for more information or contact Oerlikon AM directly through their web site at www.oerlikon.com/am.

4 Commercial Information

4.1 Ordering Information and Availability

| Product | Order No. | Package Size | Availability | Distribution |
|----------------|-----------|------------------------|--------------|--------------|
| MetcoAdd 6022A | 1522720 | 10 lb (approx. 4.5 kg) | Stock | Global |

4.2 Handling Recommendations

- Store in the original container in a dry location.
- Open containers should be stored in a drying oven or humidity controlled environment to prevent moisture pickup.
- Tumble contents gently prior to use to prevent segregation.

4.3 Safety Recommendations

See the SDS 50-2608 (Safety Data Sheet) in the localized version applicable to the country where the material will be used. SDS are available from the Oerlikon web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).

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