AMDAP™ Series – Metal Powders for 3D Printing –

Stainless steel powder for 3D - printing large plastic molds AMDAP™ LTX420

AMDAP™ LTX420 have been developed by adjusting chemical composition of metal powder suitable for additive manufacturing for large plastic molds exceeding 150mm square by SLM.

Characteristics

- Powders are produced by gas atomization and have high flowability.
- SUS420J2 (AISI 420) based powder, widely used for plastic molds, optimized for 3D printers.
- Large-sized products can be 3D-printed with preheating at 120°C without special treatment.
- Quenching and tempering hardness are equivalent to SUS420J2 and 53HRC can be obtained.
- Corrosion resistance is equivalent to SUS420J2.
- Pinholes can be caused during 3D-printing, so care must be taken in using for high-mirror applications.

Major applications

Plastic molds requiring corrosion resistance and wear resistance

Typical chemical composition and hardness in use

Typical chemical composition(mass%)				Hardness in use(HRC)
C	Ni	Cr	V	
0.27	1.5	13	0.1	Tempering at 200°C:53HRC Annealing at 700°C:32HRC

Particle size

Particle size(μm)
-53/+25

Mold manufacturing process

3D-printing — Base plate temperature ≧120°C is recommended. 3R or more is recommended for corners. 3D-printing parameters are shown in Table 1.

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Annealing — 35-32HRC can be obtained at 650-700°C for 1h, twice.

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Removing from base plate

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Machining

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Quenching and tempering — Quenching：1030°C, Tempering：200°C, Hardness：52～53HRC } Heat treatment conditions are the same as SUS420J2 steel. (Low temperature tempering is recommended.)

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Finish machining

Fig.1 Mold manufacturing process of AMDAP™ LTX420.

Table 1 Recommended 3D-printing parameters for AMDAP™ LTX420.*1

Part	Laser power (W)	Laser spot diameter (μm)	Scanning speed (mm/s)	Hatching distance (mm)	Layer thickness (μm)
Inside	375	180	750	0.13	50
Contour	150	100	350	-	50

*1 The data shown in Table 1 are 3D printing process parameters for GE Additive's Concept Laser M2 machine. When using other equipment, please refer to the table for optimizing conditions. Please feel free to ask our Metal Powder Department about the process parameters.

Heat treatment properties

Hardness equivalent to annealed SUS420J2 steel can be obtained by annealing twice at 700°C.

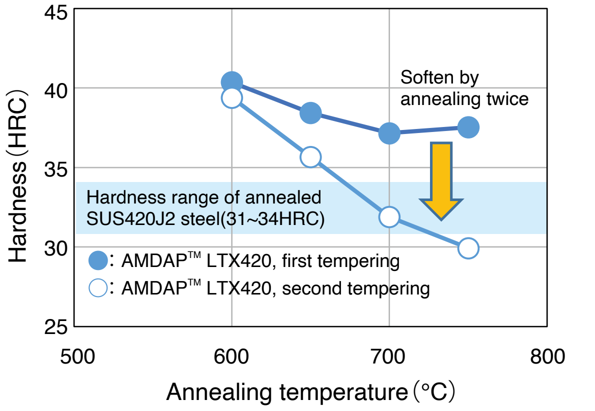

Fig.2 Relationship between annealing temperature and hardness after 3D-printing.

Quenching and tempering properties are equivalent to SUS420J2 type steel.

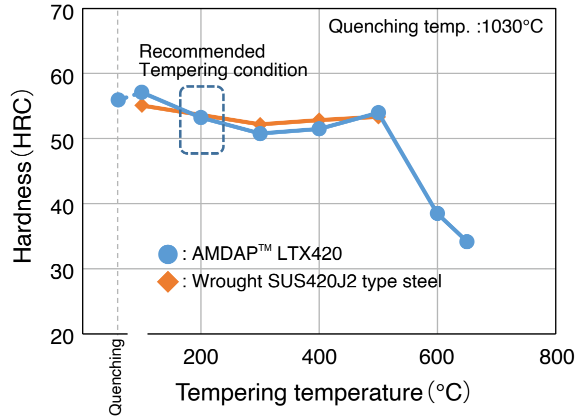

Fig.3 Relationship between tempering temperature and hardness.

Mechanical properties

Slightly lower proof stress than wrought steel.
Charpy impact value is equal or higher.

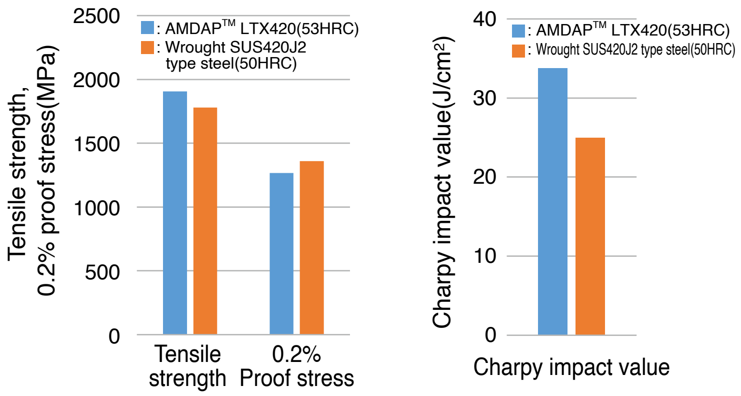

Fig. 4 Comparison of mechanical properties.

Corrosion resistance

Corrosion resistance is equivalent to SUS420J2 series steel.

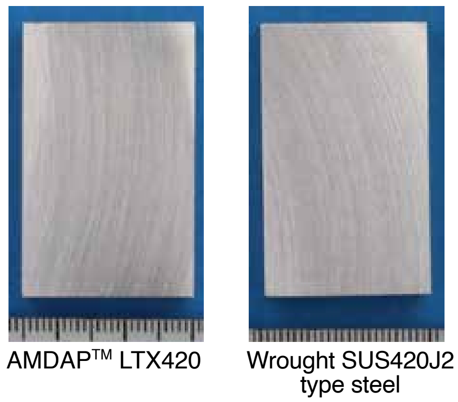

Fig.5 Comparison of corrosion resistance by wet test.
(Set temperature:50°C, Humidity:90%, Holding time:48h)

Thermal conductivity

Thermal conductivity is equivalent to SUS420J2 type steel.

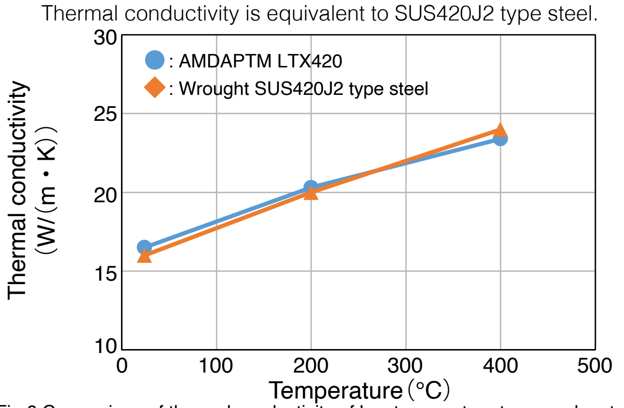

Fig.6 Comparison of thermal conductivity of low-temperature tempered materials.

3D-printed sample

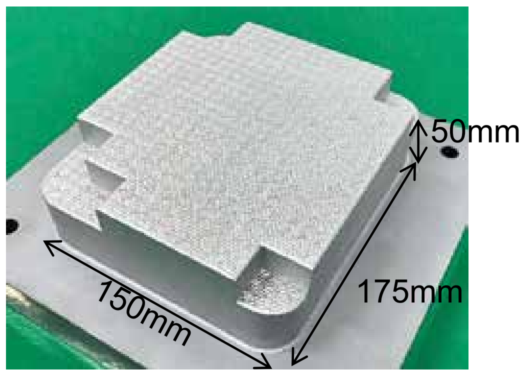

Fig.7 Example of 3D-printed sample.
(baseplate temperature 120°C)

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