Meltio Nickel 625

Inconel 625 / ERNiCrMo-3 / S Ni 6625 / 2.4831

Nickel 625 is a superalloy that offers excellent strength, corrosion resistance, and heat resistance. It is a popular material choice in a wide range of applications, including aerospace, chemical processing, and naval industry, where it can withstand high temperatures and harsh environments. Among superalloys, Nickel 625 excels for its weldability, making it an ideal choice for cladding or repair of components working at high temperatures or requiring increased corrosion protection.

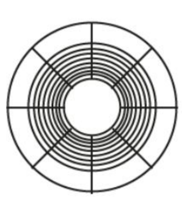
Properties	Weldability, High Temperature Resistance and High Corrosion Resistance
Applications	Aerospace, Chemical Processing,Naval and Oil & Gas

Wire Chemical Composition	Ni	C	Si	Mn	Cr	Fe	Mo	Nb	S
Weight Percent [%]	Bal.	0.02	0.2	0.2	22.0	1.0	9.0	2.5	0.01

Wire Density
8.20 g/cm³

Melting Point		
1565 - 1625 K	1290 - 1350 ºC	2350 - 2460°F

Spool Specs



Meltio Materials are tightly spooled and packaged to ensure the best compatibility with Meltio systems.

Wire Diameter	1.0 mm
Weight on Spool	15 kg
Volume on Spool	1829 cm³
Spool Type	BS300
Wire Coating	Uncoated

Heat Treatment

To achieve the best mechanical properties, Nickel 625 should be heat-treated. In Cladding applications heat-treatment may not be required. The standard heat treatment process for nickel 625 involves two steps: Solution Annealing and Age Hardening. Solution annealing removes internal stresses that have been formed during 3D printing. Machining may take place before or after the solution annealing. Once the component has been age hardened to final properties its machinability is compromised.

Solution Annealing

HT.1: Protective atmosphere Heat up to 1050ºC	Hold for 1h Rapid Cooling to RT

Age Hardening

HT.2: Protective atmosphere Heat up to 720ºC in 2h	Hold at 720ºC during 8h Cool down to RT

**Typical Parameters for a Sample of 160x60x30 mm*

Deposition Parameters

The following 3D printing parameters were found to provide fully dense samples. Please use the provided “Density Verified Profiles” and refer to the document “Printing Parameters and their effect on part density” for additional information.

Laser Power [W]	**Velocity [mm/s]**	**Argon Flow [l/min]**	**Layer Height [mm]**	**Wire Speed [mm/s]**	**Energy Density [J/mm3]**
1100	10	10	0.8	10.2	138

Meltio Material Datasheet

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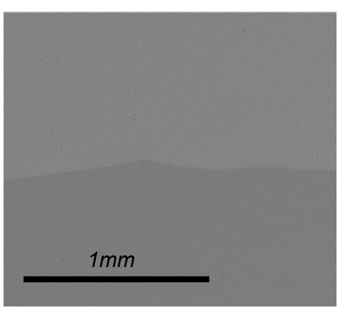
Cladding and Dual Material Applications

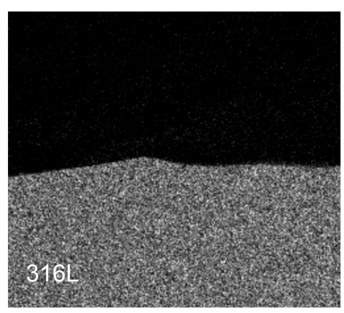
Nickel 625 is highly resistant to wear, deformation and heat, which makes it an excellent material for cladding or dual material applications where not the entire component requires these properties. Nickel 625 has excellent weldability and can be used to form a dense and well-bonded coating layer that provides high wear resistance as well as excellent corrosion and temperature resistance.

Elemental Mapping

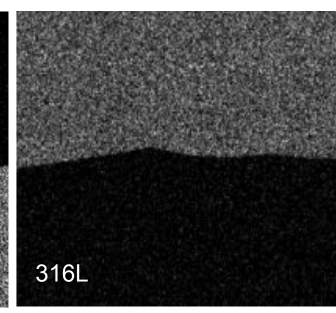
Elemental (EDX) Mapping is employed to characterize the dilution of the two materials. Meltio used as deposited Stainless Steel 316L as the substrate without post processing. Results show low dilution between the materials.



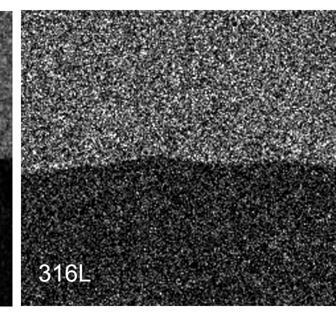
Cladding interface layer XZ
Electron Microscopy



Cladding interface layer XZ
Iron EDX Map



Cladding interface layer XZ
Nickel EDX Map

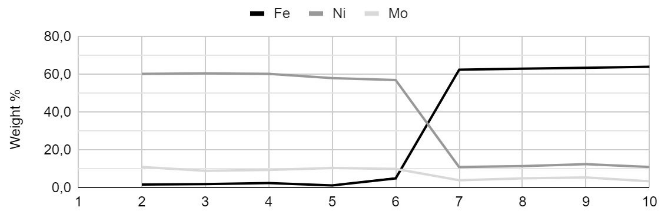


Cladding interface layer XZ
Molybdenum EDX Map

Elemental Distribution

Composition Mapping of Nickel 625 Cladding on SS316L. Measurements were spaced 150 µm.Apart with measurement 5 coinciding with the interface of the two materials.

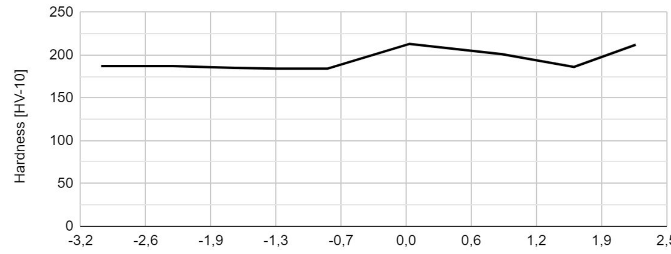
Measurement [Position]	Nb [wt%]	Mo [wt%]	Mn [wt%]	Fe [wt%]	Ni [wt%]
1	3.5	11.0	0.5	1.8	60.3
2	3.8	9.0	0.1	2.0	60.5
3	4.0	9.5	0.5	2.5	60.3
4	6.5	10.5	0.8	1.3	58.0
Interlayer					
5	4.0	10.0	0.5	5.0	57.0
6	0.5	4.0	1.5	62.5	11.0
7	1.5	5.0	1.0	63.0	11.5
8	0.5	5.5	1.5	63.5	12.5
9	0.5	3.5	1.5	64.0	11.0
10	1.0	4.0	1.5	64.5	11.5



Hardness Profile

Hardness was measured across the material transition and results indicate that a single cladding layer is sufficient to achieve good and stable properties.

Hardness [HV10]	Distance [mm]	Material [txt]
212	2.2	Nickel 625
186	1.6	
201	0.9	
213	0.0	**Interlayer**
184	-0.8	Stainless Steel 316L
184	-1.3	
185	-1.7	
187	-2.3	
187	-3.0	



** Meltio's work on material characterization is carried out using the Meltio M450 and it remains under constant development. Specifications provided herein may not reflect the latest state of our research. For further information and questions please contact us via info@meltio3d.com.*

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