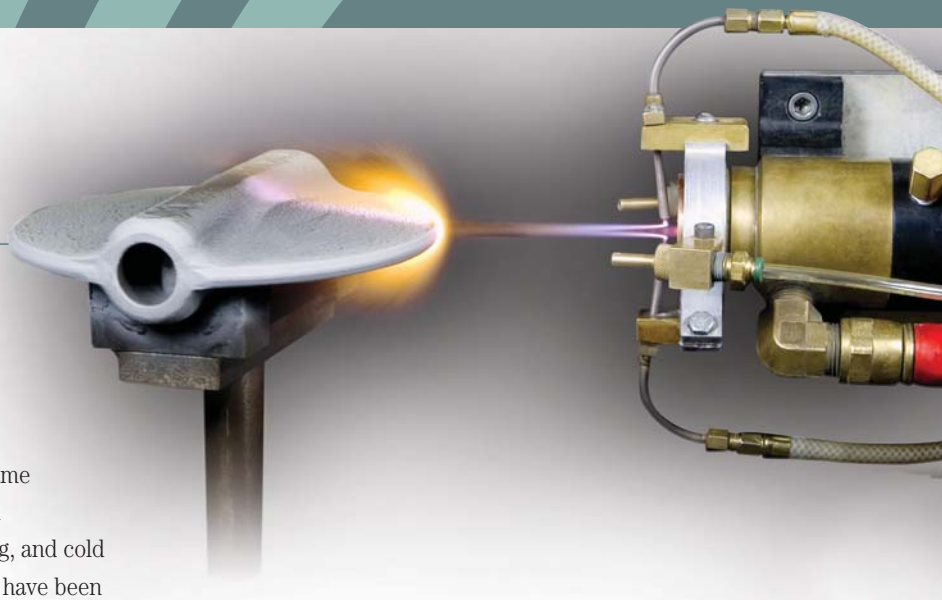
CARPENTER
Powder Products

Thermal Spray



Thermal Spray processes have been a popular application for CPP powder metals for many years. Micro-Melt® gas atomized powders have been used in a wide range of thermal spray processes including flame and plasma spraying, HVOF spraying, vacuum plasma spraying, low pressure plasma spraying, and cold spraying. These highly alloyed metal powders have been used to enhance surface properties in harsh environments and to protect industrial surfaces from corrosion, oxidation and erosion due to wear and extreme temperatures. They have been used in a wide range of applications including jet engines, land-based turbine components, offshore oil applications, as well as numerous automotive and industrial components.

Standard Packaging

PE Bottles	5 kg	10 lbs
PE Pails	25 kg	50 lbs

Other packages available upon request.

Standard Sizes

	Micron	Mesh
Flame and	125 / 45	-120 / +325
Plasma Spraying	105 / 45	-140 / +325
	90 / 45	-170 / +325
	45 / 16	-325 / +16µ
HVOF	53 / 22	-270 / +22µ
	45 / 16	-325 / +16µ
VPS / LPPS	45 / 16	-325 / +16µ
	- 44	-325

Tolerances Max. 5% over and 10% under.
Measuring Method Laser Equipment ASTM B214 Microtrac.
Other screen sizes available upon request.

Ready to Meet Your Needs

A pioneer in the development and production of metal powders, CPP offers a tremendous variety of alloys covering nearly every application. Great pride is taken in our ability to control the alloy's chemistry and particle size to meet customers' stringent requirements. Superb consistency is provided within and between production lots.

Being the only major powder metals manufacturer with production facilities in both North America and Europe enables CPP to supply customers in a timely and cost effective manner. Currently in place are one 450 kg and two 1000 kg furnaces in Bridgeville, PA, USA, a 1200 kg furnace in Woonsocket, RI, USA and twin 5500 kg furnaces in Torshalla, Sweden. This is one of the largest capacities for gas atomized powder available from any manufacturer. Extensive research and development capabilities are available for developing new alloys to meet our customers' needs including a 150 kg furnace in Reading, PA, USA. Facilities include cover gas, vacuum, and air induction melt furnaces which are capable of using a variety of gasses for atomization depending upon the alloy being produced. Certifications include ISO 9001, AS 9100, and NADCAP.

Producing metal powders for over 40 years, CPP has hundreds of years of combined experience and is committed to continuous manufacturing improvement. Strategic relationships are often initiated with customers to develop and supply new powder metal alloys in the exact specification which best suits the requirements of their application.

Gas Turbine Refurbishment Powders

Micro-Melt®	Alloy	Nominal Chemical Composition (typical values in wt.%)										OEM Approval	
		Ni	Co	Cr	W	Mo	Al	Ti	Si	B	Others	GE-B50TF-	PWA
G26	BNi-4	Bal	—	—	—	—	—	—	3.5	2.0	—	26	—
G28	—	—	—	—	—	—	—	—	—	—	Yes	28	—
G72	CuNiIn	38.0	—	—	—	—	—	—	—	—	**In:** 5.0, **Cu:** Bal	72	—
G81	AMS 4782	Bal	—	19.0	—	—	—	—	10.0	—	—	81	—
G142	—	Bal	—	17.0	—	—	—	—	9.0	0.1	—	142	—
G143	—	Bal	—	15.0	—	—	—	—	8.0	—	—	143	—
G155	T-400	—	Bal	8.5	—	28.5	—	—	2.6	—	—	155	—
G173	D-15	Bal	10.0	15.0	—	—	3.5	—	—	2.3	**Ta:** 3.5	173	—
G183	Rene 80	Bal	9.5	14.0	4.0	4.0	3.0	5.0	—	—	—	183	—
G190	T-800	—	Bal	17.5	—	28.5	—	—	3.4	—	—	190	—
G191	IN738	Bal	8.5	16.0	2.6	1.7	3.5	3.5	—	—	**Nb:** 0.8, **TA:** 1.8	191	—
G192	NiCrAlY	Bal	—	21.0	—	—	10.0	—	—	—	**Y:** 1.0	192	—
G195	CoNiCrAlY	32.0	Bal	21.0	—	—	8.0	—	—	—	**Y:** 0.5	195	—
G202	IN718	Bal	—	19.0	—	3.0	0.5	1.0	—	—	**Nb:** 5.0, **Fe:** 18.0	202	—
G203	IN718+B	Bal	—	18.5	—	3.0	0.5	1.0	—	2.3	**Nb:** 5.0, **Fe:** 18.0	203	—
G204	AMS 4777	Bal	—	7.0	—	—	—	—	4.1	3.0	**Fe:** 3.0	204	—
G205	AMS 4778	Bal	—	—	—	—	—	—	4.5	2.9	—	205	—
G206	AMS 4779	Bal	—	—	—	—	—	—	3.5	1.9	—	206	—
G207	BNi-9	Bal	—	15.0	—	—	—	—	3.5	3.5	—	207	—
G242	BC52	Proprietary Composition for GE										242	—
G271	Rene 142	Proprietary Composition for GE										271	—
G304	MarM 509	10.0	Bal	23.0	7.0	—	—	0.2	—	—	**TA:** 3.5, **C:** 0.6	304	—
G305	MarM 509B	10.0	Bal	23.0	7.0	—	—	0.2	—	2.8	**TA:** 3.5, **C:** 0.6	305	—
P996	AMS 4776	Bal	—	13.0	—	—	—	—	4.5	2.9	**Fe:** 4.0	—	996
P1316	X-40	10.5	Bal	25.0	7.0	—	—	—	—	—	**C:** 0.55	—	1316
P1318	X-40	10.5	Bal	25.0	7.0	—	—	—	—	—	**C:** 0.55	185	1318
P1365-2	NiCoCrAlY	Bal	23.0	17.0	—	—	12.5	—	—	—	**Y:** 0.6	—	1365-2
M247	MarM 247	Bal	10.0	8.4	10.0	0.7	5.5	1.0	—	—	**Ta:** 3.5, **Hf:** 1.4	—	—
IN713	IN713	Bal	—	14.0	—	—	6.0	1.0	—	—	**Nb:** 2.0	—	—
A4783	AMS 4783	17.0	Bal	19.0	4.0	—	—	—	8.0	0.8	—	—	—
BRB	BRB	Bal	9.0	14.0	—	—	4.0	—	—	2.5	—	—	—
A914	A914	Bal	—	20.0	—	3.0	0.5	1.0	4.3	3.0	**Nb:** 5.0, **Fe:** 18.0	—	—

HVOF, Plasma Spray and Flame Spray Powders

Micro-Melt®		UNS #	HVOF	Plasma	Flame	VPS	X - Ref
309L	Fe Based	S30983	●	●	●	●	
316L		S31683	●	●	●	●	41C
410		S41080	●	●	●		
410L			●	●	●		
420		S42080	●	●	●		
431		S43100		●	●		42C
6	Co Based	R30006	●				
CCM Plus®[1]			●				21
CCW			●				
T-400			●	●	●	●	
T-800			●	●	●	●	
600	Ni Based	N06600	●	●	●	●	44
625		N06625	●	●	●	●	IN625
622			●	●	●	●	
690			●				Alloy 52
H-13	Tool Steels	T20813	●	●			
A11LVC			●	●			

1 US Patent Number 5,462,575

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Plasma Transferred Arc (PTA) and Laser Overlay

Plasma Transferred Arc (PTA) and Laser Overlay processes are used with metal powders to produce protective surfaces with metallurgical bonds to the substrate. These protective attributes include:

- Corrosion resistance
- Abrasion resistance
- Wear resistance
- Heat resistance

In addition, the processes are often used to repair worn parts at a lower cost than a replacement part and with potentially longer service life than with the original materials. PTA is particularly well suited to automation and large volume production of parts with deposition rates up to 20 lbs/hr possible. While the low heat input of the laser process results in a low heat affected zone which provides a nearly stress free overlay, fine microstructure, and high hardness. The low dilution rate and metallurgical bond provide a nearly impenetrable barrier to corrosive materials when the proper alloy is chosen and properly applied for the intended service.

A wide array of metal powders is available to enhance surface properties and protect industrial surfaces from corrosion, oxidation, and erosion due to wear and extreme temperatures. They are used in many applications from hard faced engine valves to forging punches and other tooling applications to coatings for offshore oil platforms and for coating or repairing a wide variety of other automotive or industrial parts.

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PTA, Hardfacing, and Laser Overlay Powders

Micro-Melt®	UNS No.	Nominal Chemical Composition (typical values in wt.%)									Typical Deposited Hardness (HRC)	Application
		C	Cr	Ni	Mo	Fe	Co	Si	Mn	Others		
Stainless Steel												
309L	S30983	<0.1	24.0	13.0	<1.0	Bal	—	<0.5	<1.8	—	—	Corrosion, Intermediate Layer
316L	S31683	<0.1	17.0	11.0	2.0	Bal	—	0.6	1.5	**Cu:** <1.0	—	Corrosion, Intermediate Layer
316L Si	S31688	<0.1	19.0	12.0	2.5	Bal	—	0.8	1.75	**Cu:** <1.0	—	High Silicon For Flat Weld Beads
410	S41080	<0.2	12.5	≤0.6	—	Bal	—	≤1.0	≤1.0	—	38-42	Corrosion, Wear
410L	S41008	<0.1	12.5	≤0.5	—	Bal	—	0.6	≤1.0	—	30-36	Corrosion, Wear
420	S42080	<0.5	12.5	1.75	—	Bal	—	—	—	—	48-50	Corrosion, Wear
431	—	<0.2	16	1.75	—	Bal	—	—	—	—	—	Corrosion, Wear
17/4	S17400	<0.1	16.0	4.0	—	Bal	—	≤0.5	≤0.5	**Cu:** 4.0, **Nb:** 0.3	—	Build-up
Cobalt Based												
1	R30001	2.8	31.5	1.5	0.5	1.5	Bal	1.0	0.5	**W:** 13.5	50-52	Hot Wear, Corrosion
6	R30006	1.1	28.5	1.5	0.5	1.5	Bal	1.0	0.5	**W:** 5.0	40-42	Hot Wear, Corrosion
12	R30012	1.6	30.5	1.5	0.5	1.5	Bal	1.0	0.5	**W:** 9.0	45-47	Hot Wear, Corrosion
21	R30021	0.25	27.5	<2.5	5.5	<2.0	Bal	—	—	—	28-40	Hot Wear, Corrosion
CCM Plus®[1]	—	0.25	27.5	<1.0	5.5	<1.5	Bal	1.0	—	—	35-43	Hot Wear, Corrosion
CCW	—	<0.2	28.0	10.0	5.5	<2.0	Bal	<1.0	<1.0	**W:** 4.5, **Ta:** 0.8, **Co:** Bal	25-45	Critical Corrosion and Wear
F	R30002	1.7	28.0	23.0	—	2.0	Bal	1.0	<0.1	**W:** 12.5	38-40	Hot Wear, Corrosion
T-400	R30400	—	8.5	—	28.5	—	Bal	2.6	—	—	—	High Temp Wear, Metal to Metal Wear
T-800	—	—	17.5	—	28.5	—	Bal	3.4	—	—	—	High Temp Wear, Metal to Metal Wear
Nickel Based Super Alloys												
625	N06625	<0.1	21.5	Bal	9.0	2.0	—	0.5	0.5	**Nb:** 3.6, **Al:** <0.1, **Ti:** <0.1	34-36	Corrosion, Wear
622	—	<0.02	21.5	Bal	13.5	3.0	—	0.5	0.4	**W:** 3.0, **V:** 0.35	—	High Temp Corrosion
690	—	<0.02	29.0	Bal	—	10.0	—	—	—	—	—	High Temp Corrosion
718	—	0.04	18.5	Bal	3.0	19.0	—	—	—	**Nb:** 5.0, **Ti:** 1.0, **Al:** 0.5	—	High Temp Corrosion
Nickel Based Hardfacing												
B27	—	<0.1	—	Bal	—	—	—	3.5	—	**B:** 1.3	25-28	Build-up, Cast Iron
B40	—	0.2	9.0	Bal	—	2.9	—	3.1	—	**B:** 1.7	37-42	Wear, Corrosion
B50	N99645	0.4	12.0	Bal	—	3.5	—	3.8	—	**B:** 2.4	48-52	Wear, Corrosion
B56	N99645	0.5	14.5	Bal	—	4.0	—	3.7	—	**B:** 3.0	53-57	Wear, Corrosion
Tool Steels												
H-13	T20813	0.4	5.1	—	1.3	Bal	—	—	—	**V:** 1.0	—	Build-up
A11LVC	—	1.8	5.0	—	1.2	Bal	—	1.0	0.4	**V:** 9.0	—	Wear, Corrosion
420CW	—	<2.5	12.8	—	1.3	Bal	—	<1.0	<1.0	**V:** 9.3	—	Wear, Corrosion
4140	—	<0.5	1.0	—	0.2	Bal	—	<0.5	<1.0	—	—	Build-up
NiTung Blends - Proprietary Alloys Developed for Extreme Wear Applications												
NT-40	—	—	—	—	—	—	—	—	—	40 WC	—	—
NT-50	—	—	—	—	—	—	—	—	—	50 WC	—	—
NT-60	—	—	—	—	—	—	—	—	—	60 WC	—	—
NT-70	—	—	—	—	—	—	—	—	—	70 WC	—	—

1 U.S. Patent Number 5,462,575

The information and data presented herein are typical or average values and are not a guarantee of maximum or minimum values. Applications specifically for material described herein are made solely for the purpose of illustration to enable the reader to make his or her own evaluation and are not intended as warranties, either express or implied, of fitness for these or other purposes. There is no representation that the recipient of this literature will receive updated editions as they become available.

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Powder Products

High-Temperature Braze Applications

Brazing is often used when a metallurgical bond is required, but where welding temperatures may cause distortion of the parts or a change in the alloy's morphology. The temperatures used in brazing melt the filler powder and draw it into the base alloys to be joined via capillary action. A wide variety of brazing applications exist in aircraft engines, land-based turbines, chemical equipment, medical devices, and food handling components, among others. CPP provides clean, spherical, gas atomized powders in a wide range of standard alloys for use in these markets. The powders are provided with very consistent chemistries and particle sizes to provide uniform products and production flow rates. Many of the more common alloys used are listed in this sheet. Should another alloy be required, the Research & Development staff has extensive experience and facilities to provide what is required for your application.

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High-Temperature Braze Powders

Micro- Melt®	Alloy	Chemical Composition (Typical Values in wt.%)										AWS	X-Ref	EN 1044
		Ni	Co	Cr	Si	B	Fe	C	Mo	Al	Others			
A4775	AMS 4775	Bal	—	14	4.5	3	4.5	0.75	—	—	—	BNi-1	125	NI 101
A4776	AMS 4776	Bal	—	14	4.5	3	3	—	—	—	—	BNi-1a	L.C.	NI 1A1
A4777	AMS 4777	Bal	—	7	4.2	3	3	—	—	—	—	BNi-2	L.M.	NI 102
A4778	AMS 4778	Bal	—	—	4.5	3	—	—	—	—	—	BNi-3	130	NI 103
A4779	AMS 4779	Bal	—	—	3.5	2	—	—	—	—	—	BNi-4	135	NI 104
A4782	AMS 4782	Bal	—	19	10	—	—	—	—	—	—	BNi-5	30	NI 105
A4783	AMS 4783	17	Bal	19	8	0.8	—	0.4	—	—	**W:** 4	BCo-1	210	Co 101
G173	D-15	Bal	10	15	—	2.3	—	—	—	3.5	**Ta:** 3.5	—	—	—
G99	B50TF99	Bal	—	19.5	10	—	—	—	—	—	**Mn:** 9.5	—	35	—
G142	B50TF142	Bal	—	17	9	0.1	—	—	—	—	—	—	3003	—
BRB	BRB	Bal	9	14	—	2.5	—	—	—	4	—	—	—	—
A914	1914	Bal	—	20	4.3	3	—	—	—	—	—	—	—	—
G207	BNi-9	Bal	—	15	—	3.5	—	—	—	—	—	BNi-9	150	—
B-20	B-20	Bal	—	—	2.5	1.4	—	—	—	—	—	—	#25	—
B-27	B-27	Bal	—	—	3.5	1.3	—	0.05	—	—	—	—	—	—
B-33	B-33	Bal	—	4.5	3.3	1.5	1.5	0.2	—	—	—	—	—	—
B-40	B-40	Bal	—	9	3.1	1.7	2.9	0.3	—	—	—	—	#42	—
B-50	B-50	Bal	—	12.5	3.8	2.5	4.3	0.6	—	—	—	—	#52	—
B-56	B-56	Bal	—	13	3.7	3	4	0.7	—	—	—	—	#56	—
B-60	B-60	Bal	—	14.5	4.3	3.2	4.3	0.8	—	—	—	—	#62	—
B-60C	B-60C	Bal	—	15	4.3	3.4	4.2	0.7	2.5	—	**Cu:** 2.5	—	#69	—
Ni-11P	—	Bal	—	—	—	—	—	—	—	—	**P:** 11	BNi-6	—	—
CuNiSnP	—	4.2	—	—	—	—	—	—	—	—	**Cu:** Bal, **Sn:** 15.5, **P:** 5.3	—	—	—

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