

Morgan Advanced Materials

Morgan Advanced Materials is a global engineering company offering world-leading competencies in material science, specialist manufacturing and application engineering.

Wesgo offers value added solutions with precious and non-precious alloy manufacturing and Pre-Sintered Preform products (PSP). These are applied in the electronic, energy, healthcare, industrial, petrochemical, security and transport markets.

We focus on the delivery of products that help our customers solve technically challenging problems, enabling them to address global trend such as energy demand, advances in healthcare and environmental sustainability.

What differentiates us?

- Advanced material science and processing capabilities.
- Extensive applications engineering experience.
- A strong history of innovation and reinvention.
- Consistent and reliable performance.
- A truly global footprint.
- We find and invest in the best people.

New solutions for complex and technologically demanding problems

There are significant trends shaping our modern world. Increasingly, resources are becoming more scarce and harder to access, our climate and environment is changing, and the pace of innovation and technology change is accelerating.

Each of these directly or indirectly puts more demand on materials, and so advanced materials have never been more important. Morgan's highly experienced scientists and application engineers actively engage with customers, to find new solutions for complex and technologically demanding problems. This goes hand in hand with our commitment to the environment, to health and safety, and to operating to a high-ethical standard.

Brazing Tool App

Our App delivers valuable engineering information at your command. For braze engineers, this offers stand-alone capabilities to answer questions without going back to an office or searching for references. For years our customers have counted on our quality products and innovation. In a world of many choices and little time, having the right tools at hand can make all the difference. Available on the App Store.



What you can do with the new Wesgo Metals mobile App:

- Search our vast offerings of low-vapor pressure alloys by name, element, or liquidus temperature
- Explore the material and mechanical properties of over 60 alloys
- Select any two substrates you want to braze together, and get our suggestions on alloys suitable to join these materials
- Make a quick calculation on thermal expansion of over 120 materials in the included library, or enter your own CTE values

For all inquiries, please contact our specialist sales and marketing offices:

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Advanced thinking
in Braze Alloys

WESGO

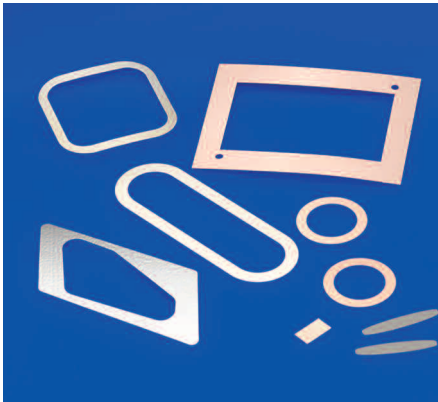
Innovative solutions for complex and technologically demanding problems

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WESTern GOld and Platinum Works (WESGO) was founded in San Francisco in 1927 to serve the jewellery and dental industries by smelting and refining precious metals.

Starting in the 1950's WESGO developed gold and silver-based braze alloys for joining metal to metal. Then in the 1970's, active braze alloys were also developed which allowed for brazing metals directly to ceramics without metallization and plating processes.



Wesgo's focus has always been precious metals of the highest quality and purity for demanding customer applications. This typically means vacuum or high purity atmosphere brazing for the medical, aerospace, semiconductor industries, analytical instrumentation, energy, including Oil, Gas and IGT as well as scientific research. Our commitment to the highest quality remains the same since 1927.

Our product groups

Braze alloys

- High purity, low vapor pressure alloys
- From pour to final form
- Melt spun foils
- Active alloys

Powder Metallurgy

- Presintered Preforms
- Formulations by design

Turnkey Brazing Services

- Ultinex™ active brazing
- Ceramic/metal/composite joining capability
- High temperature joining
- Biocompatible seals

With various alloys in temperature range from 715°C (1320°F) up to more than 1750°C (3180°F), Wesgo is one of the leaders for the

Aerospace, Medical, Electronic and Vacuum industries.

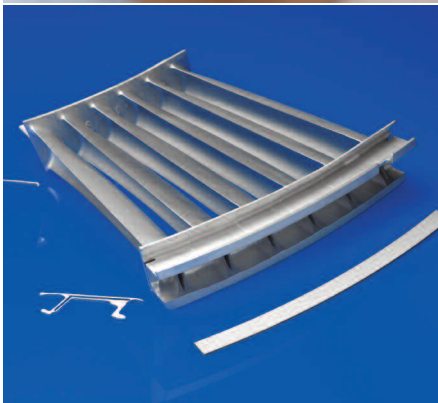
Our production site is dedicated exclusively to the production of vacuum grade alloys. All the alloys made by Wesgo are melted under vacuum. Therefore there are no elements with low vapor pressure in our brazing materials. This makes them suitable for vacuum application and enables the brazing of highly reliable hermetic seals in severe service applications.



We manufacture and supply this wide range of precious high-purity, low vapor pressure brazing alloys in various forms. Many readily available items are offered.

For specially designed preforms and complex configurations we can work with your drawings to meet your specific needs.

We offer value added solutions with precious and non precious alloy manufacturing, active brazing technology and pre-sintered preform products

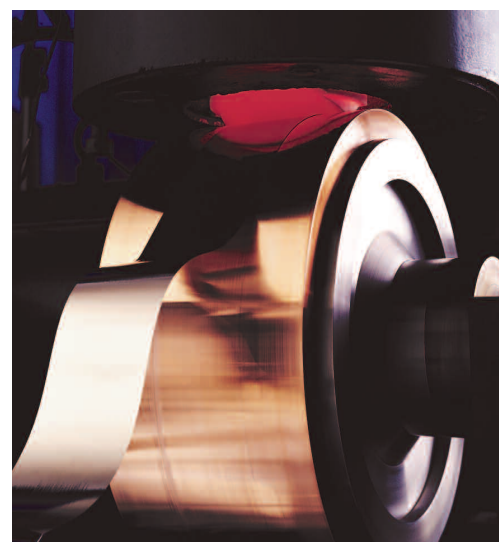


Aerospace

Morgan Advanced Materials produces high purity, precision alloy preforms for commercial and military aircraft.

Our capability for consistent high-quality, volume manufacturing helps manufacturers to meet ambitious cost/performance ratios. Our engineered materials and components are trusted around the world to ensure the safety of users through preventative or correction maintenance.

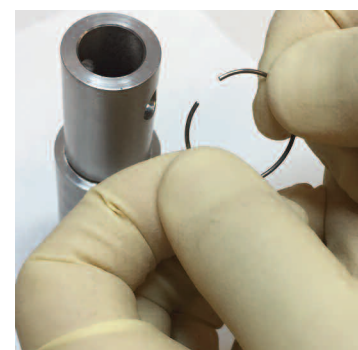
- Precious and non-precious braze alloys in either paste, wire, powder, foil or pre-forms
- Our active alloys eliminate the need for intermediary metallisation to allow a complete metallurgical bond
- Pre-sintered preforms (PSP) are excellent for crack repair and dimensional restoration of aero-engine components such as blades and vanes
- Stopyt® liquid is a braze inhibitor suspended in organic liquid, and when applied to a metal surface, prevents the unwanted flow of molten brazing alloys



Our range of solutions for the maintenance, repair and overhaul of aircraft includes:

- High purity alloys of Gold, Palladium and Nickel
- Pre-Sintered Preforms (PSP) and Paste for crack repair
- Flexicore AMS 4777 - flexible wire in Nickel alloy
- Rod and wire form for weld repair
- Melt-spun foils and preforms per customer specification
- Atomised powders and paste
- In-house brazing for prototyping
- Active braze alloys for joining non-traditional ceramics and metals
- Meets OEM Certification requirements

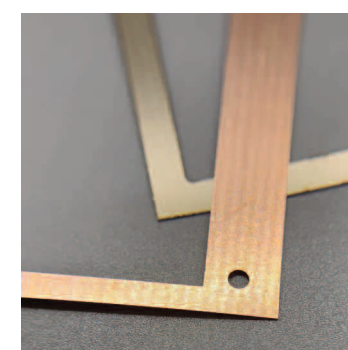
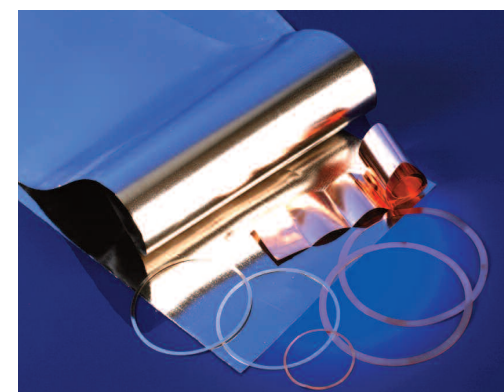
Metal spun foil	Liquidus °C (°F)	Solidus °C (°F)	Ni	Pd	Other	AMS Spec	AWS Spec
Icronibsi® -14	1077 (1970)	977 (1790)	73.8	-	Cr-14, Si-4.5, B-3.2, Fe-4.5	4776	BNi-1a
Nibsi® M	1071 (1960)	993 (1820)	92.8	-	Si-5.6, B-1.6	-	-
Nibco™ -4	1067 (1953)	988 (1810)	73.3	-	Co-20, Si-4, B-2.7	-	-
Nicro™ -B	1055 (1930)	1055 (1930)	84.4	-	Cr-15.2, B-4	-	BNi-9
Nibsi® -4	1038 (1900)	982 (1800)	92.3	-	Si-4.5, B-3.2	4778	BNi-3
Icronibsi® -7	999 (1830)	971 (1780)	82.3	-	Cr-7, Si-4, B-3.2, Fe-3	4777	BNi-2
Palnico® -30	977 (1790)	941 (1725)	57.1	30	Cr-10.5, B-2.4	-	-
Palnico® -36-M	960 (1760)	820 (1508)	50	36	Cr-10.5, Si-0.5, B-3	-	-
Palnisi™ -47	851 (1564)	810 (1490)	47.2	46.7	Si-6.1	-	-



Radiology and Imaging

Morgan Advanced Materials, Wesgo Metals site, produces high purity, low vapor pressure braze alloys for vacuum sealed applications that must survive for years of heavy use.

There is a reason why top OEM's use our alloys, it's because of our commitment to producing the highest quality components. From initial vacuum casting, to a final inspection, all components must meet the customers drawing, and our standards to ship out the door.



Radiology and Imaging products and services include:

- High purity Gold and Copper alloys
- Stamped washers and coiled ring shapes
- Atomized powders and paste
- In-house brazing for prototyping
- Active braze alloys for joining non-traditional ceramics and metals
- In-house chemical analysis



Our capability for consistent high-quality, volume manufacturing helps manufacturers to meet ambitious cost/performance ratios

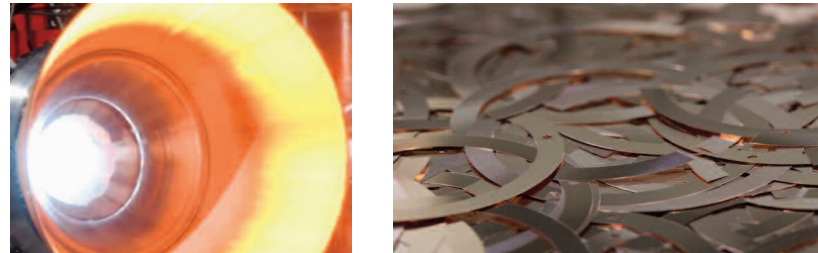


Security and Defense application examples

- Vacuum compatible braze alloys for TWTs and cargo x-ray systems
- Joining ceramic and CMC missile components
- Metallize electrical pattern traces on ceramics
- Brazing night vision assemblies
- Joining armor components
- High temperature joining solutions for sensors

Security and Defense

Morgan Advanced Materials, Wesgo Metals products have been used for decades in joining applications where reliable dependability is paramount. Our range of precious and non-precious alloys join the components that keep systems viable in extreme conditions.

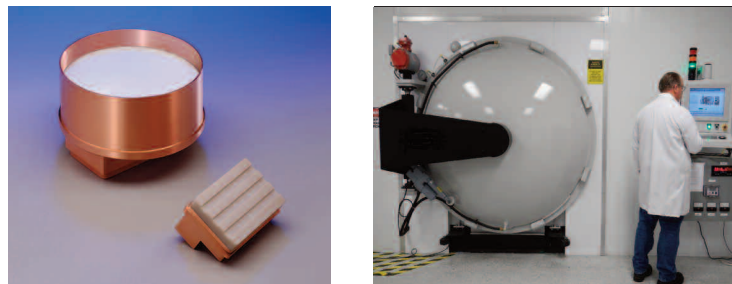
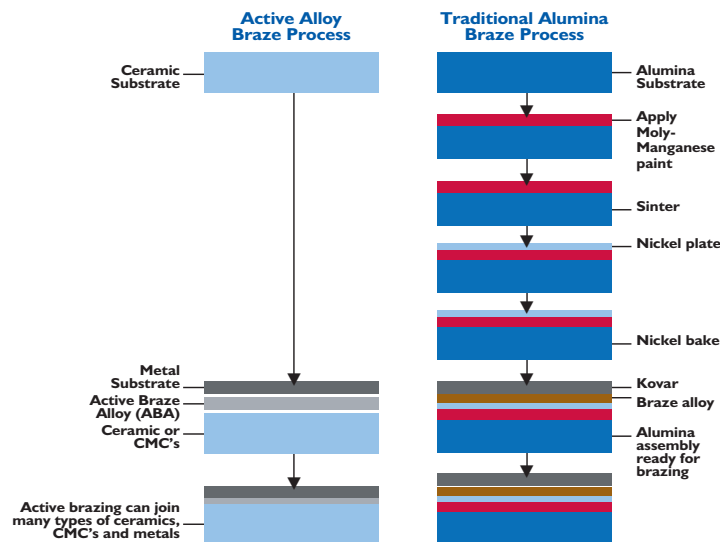


Active alloys	Liquidus °C (°F)	Solidus °C (°F)	Ag	Au	Cu	Ni	Ti	Other Elements
Gold-ABA®	1030 (1886)	1003 (1837)	-	96.4	-	3	0.6	-
Copper-ABA®	1024 (1875)	958 (1756)	-	-	92.75	-	2.25	Al-2.0, Si-3.0
Tini™-67	980 (1796)	942 (1730)	-	-	-	33	67	-
Ticuni®	960 (1760)	910 (1670)	-	-	15	15	70	-
Ticuni®-60	940 (1725)	890 (1635)	-	-	15	25	60	-
Silver-ABA®	912 (1673)	860 (1580)	92.75	-	5	-	1.25	Al-1.0
Ticusil®	900 (1650)	780 (1435)	68.8	-	26.7	-	4.25	-
Cusil-ABA®	815 (1500)	780 (1435)	63	-	35.25	-	1.75	-
Cusin-I-ABA®	806 (1483)	775 (1427)	63	-	34.25	-	1.75	Sn-1.0
Incusil®-ABA™	715 (1319)	605 (1121)	59	-	27.25	-	1.75	In-12.5

Ultinex™ Active Braze Services

As the first company to commercialize active brazing, Morgan Advanced Materials has developed several proprietary steps that incrementally improve braze yields of many types of ceramic to metal combinations. These process steps together form the Ultinex™ process we follow in active brazing. From small scale development assistance to high volume production, the Ultinex™ process delivers consistent results.

Active process vs. other alumina joining processes



Precious Brazing Filler Metals

Precious Brazing Filler Metals	Liquidus °C (°F)	Solidus °C (°F)	Ag	Au	Cu	Ni	Pd	Other	AMS SPEC	AWS SPEC
Platinum	1769 (3216)	1769 (3216)	-	-	-	-	-	Pt-99.995	-	-
Palladium	1555 (2831)	1555 (2831)	-	-	-	-	99.99	-	-	-
Paloro®	1270 (2318)	1200 (2192)	-	92	-	-	8	-	-	BAu-8
Palni®	1238 (2260)	1238 (2260)	-	-	-	40	60	-	-	-
Palco®	1219 (2226)	1219 (2226)	-	-	-	-	65	Co-35	-	BPd-1
Palnicusil®	1179 (2155)	910 (1670)	48.5	-	19	10	22.5	-	-	-
Palniro®-4	1169 (2136)	1135 (2075)	-	30	-	36	34	-	4785	-
Palniro®-1	1121 (2050)	1102 (2016)	-	50	-	25	25	-	4784	-
Copper (OFHC)	1083 (1981)	1083 (1981)	-	-	99.999	-	-	-	-	-
Palsil®-10	1070 (1958)	1025 (1877)	90	-	-	-	10	-	-	-
Gold	1064 (1947)	1064 (1947)	-	99.95	-	-	-	-	-	-
70Au-30Ni	1050 (1925)	960 (1760)	-	70	-	30	-	-	-	-
Palniro®-7	1037 (1899)	1005 (1841)	-	70	-	22	8	-	4786	-
Nicoro®-15	1030 (1886)	1000 (1832)	-	35	62	3	-	-	-	BAu-3
Incuro™-20	1025 (1877)	975 (1787)	-	20	78	-	-	In-2	-	-
Palnicurom®-10	1013 (1855)	970 (1778)	-	25	37	10	15	Mn-13	-	-
35% Gold 65% Copper	1010 (1850)	990 (1814)	-	35	65	-	-	-	-	-
37.5% Gold 62.5% Copper	1005 (1841)	985 (1805)	-	37.5	62.5	-	-	-	-	-
RI-46	1004 (1840)	971 (1780)	-	35	31.5	14	10	Mn-9.5	-	-
40% Gold 60% Copper	1000 (1832)	980 (1796)	-	40	60	-	-	-	-	-
Gemco®	975 (1787)	820 (1508)	-	-	87.75	0.25	-	Ge-12	-	-
50% Gold 50% Copper	970 (1778)	955 (1751)	-	50	50	-	-	-	-	-
Silver	960 (1760)	960 (1760)	99.999	-	-	-	-	-	-	BAG-0
Niuro®	955 (1751)	955 (1751)	-	82	-	18	-	-	4787	BAu-4
Nicuman®-23	955 (1751)	925 (1697)	-	-	67.5	9	-	Mn-23.5	-	-
Palcusil®-25	950 (1742)	900 (1652)	54	-	21	-	25	-	-	BAG-32
RI-49	949 (1740)	927 (1700)	-	31	33.5	9.75	9.75	Mn-16	-	-
Nicoro®-80	925 (1697)	910 (1670)	-	81.5	16.5	2	-	-	-	-
Nicuman®-37	925 (1697)	880 (1616)	-	-	52.5	9.5	-	Mn-38	4764	-
80% Gold 20% Copper	910 (1670)	908 (1666)	-	80	20	-	-	-	-	-
Incuro™-60	900 (1652)	860 (1580)	-	60	37	-	-	In-3	-	-
Palcusil®-15	900 (1652)	850 (1562)	65	-	20	-	15	-	-	-
Silcoro®-75	895 (1643)	885 (1625)	5	75	20	-	-	-	-	-
Nicusil®-8	893 (1639)	771 (1420)	56	-	42	2	-	-	4765	-
Gapasil®-9	880 (1616)	845 (1553)	82	-	-	-	9	Ga-9	-	-
Palcusil®-10	852 (1566)	824 (1515)	59	-	31	-	10	-	-	-
Silcoro®-60	845 (1553)	835 (1535)	20	60	20	-	-	-	-	-
95% Silver 5% Aluminum	830 (1526)	780 (1436)	95	-	-	-	-	Al-5	-	-
Palcusil®-5	810 (1490)	807 (1485)	68	-	27	-	5	-	-	-
Nicusil®-3	795 (1463)	780 (1436)	71.15	-	28.1	0.75	-	-	-	-
Cusil®	780 (1436)	780 (1436)	72	-	28	-	-	-	-	BAG-8
Cusiltin™-5	760 (1400)	743 (1369)	68	-	27	-	-	Sn-5	-	-
Incusil®-10	730 (1346)	685 (1265)	63	-	27	-	-	In-10	-	-
Incusil®-15	725 (1335)	605 (1120)	61.5	-	23.5	-	-	In-15	-	BAG-29
Cusiltin™-10	718 (1324)	602 (1116)	60	-	30	-	-	Sn-10	4773	-