NobelClad

Metal Reinvented

A **DMC** Company

WE MAKE METALS THAT MAKE THE WORLD. STRONGER. MORE VERSATILE. MORE DEPENDABLE.

NobelClad is the world leader in the field of explosion welding. We have more than half a century of expertise, and we are the one company with the most global resources and infrastructure committed to clad, offering bi-metallic solutions for complex industrial markets, including oil and gas, chemical, and transportation.

Our bi-metallic plates, known as DetaClad™, provide the best solution available when it comes to corrosion resistance, temperature uniformity, electrical conductivity, cost-effectiveness, strength, and lightweight design.

We work with global partners across the supply chain not only to deliver the highest-quality, most cost-efficient clad materials on time, but to inform and help develop project specifications from the onset. Our design ingenuity, technical proficiency, and unparalleled dependability make us an invaluable resource for process architects, engineers, and fabricators alike. That's why our clad materials are the preferred specification for high-stakes industrial infrastructure applications all over the world.

Bring us your impossible challenges, and we'll partner with you to achieve extraordinary solutions.

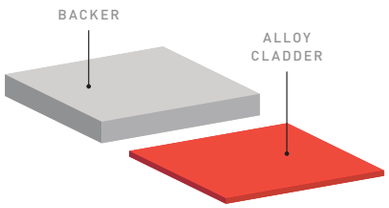

INNOVATION
STARTS WITH


THAT
H A SPARK.

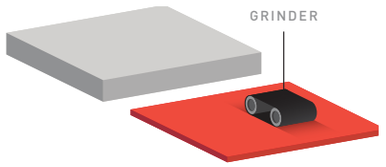
The Best of Both Metals.

Explosion cladding is a cold welding process that uses precision explosions to bond two dissimilar metals while retaining the best properties of both.

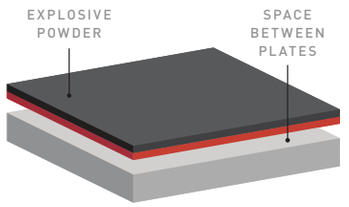
Our Explosion Cladding Process



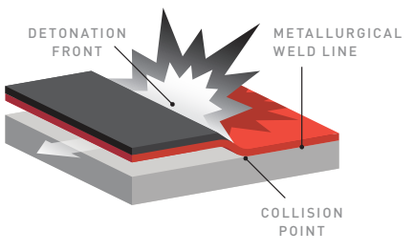
1. INSPECT MATERIAL



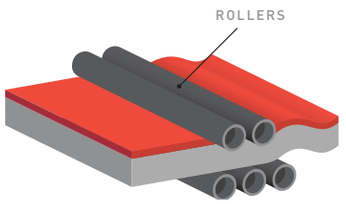
2. GRIND MATING SURFACES



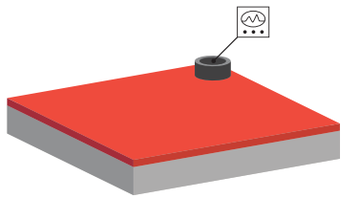
3. ASSEMBLE BACKER, CLADDER AND EXPLOSIVE



4. EXPLOSION



5. FLATTEN AND CUT



6. TEST AND INSPECT

Since the explosion weld is achieved in milliseconds, no bulk heating occurs, and the metals experience no dilution. The solid state welding process of explosion cladding results in metals that don't experience any of the negative side effects associated with other cladding methods that use heat, such as diffusion, intermetallic formation, or heat-affected zones.

Explosion cladding is incredibly versatile, resulting in hundreds of potential metal combinations. NobelClad is the only company that can deliver high shear strength and high tensile strength across every type of combination we join.

COST-EFFECTIVE CORROSION RESISTANCE	Joining a thin layer of high-value, corrosion-resistant alloy to a lower-cost metal enables more cost-effective construction of equipment.
CREVICE CORROSION RESISTANCE	Non-uniform weld overlay and mechanical fasteners create crevices, which promote corrosion. Explosion welded clad is a wrought product without crevices.
TEMPERATURE UNIFORMITY	Explosion cladding enables a designer to take advantage of the thermal characteristics of different alloys in a way that improves overall uniformity of heat distribution.
ELECTRICAL CONDUCTIVITY	Our explosion welded electrical transition joints are the industry benchmark for their ability to efficiently conduct electricity.
COMPOSITE STRENGTH & PERFORMANCE	By permanently joining plates with varying properties, a superior performing composite plate can be achieved.
REDUCED WEIGHT	Explosion welded bi-metallic solutions facilitate engineered designs where weight management is crucial.

PHOTO
Micrograph of bond zone of stainless steel bonded to low-alloy carbon steel at 50x magnification.

NobelClad in the Field.

NobelClad serves the world's high-stakes markets that demand ingenuity and dependability in metals applications.

ABOVE
Chemical processing plant located near Ulsan, Korea.

Markets

OIL & GAS

Upstream separation and processing, downstream refining

POWER GENERATION

Condensers, polysilicon production, biofuels, and geothermal applications

CHEMICAL & PETROCHEMICAL

PTA, acetic acid, nitric acid, and chlorate production

TRANSPORTATION

Transition joints in rail cars and shipbuilding

INDUSTRIAL REFRIGERATION

Everything from small chiller units to large institutional HVAC systems

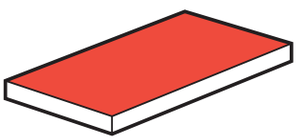
METAL REDUCTION/ PROCESSING

Hydrometallurgy autoclaves, current-conducting electrode arms, and titanium and magnesium reducing pots

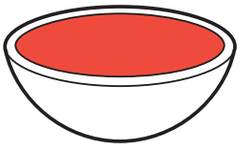
ALUMINUM/ZINC SMELTING

Anode and cathode electrical transition joints

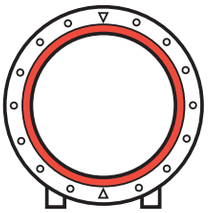
Plate Products



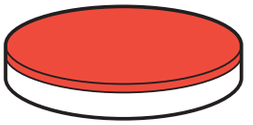
PLATES



HEADS

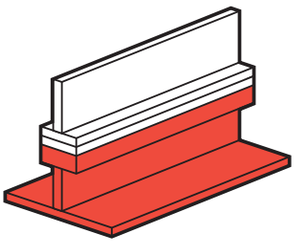


SHELLS

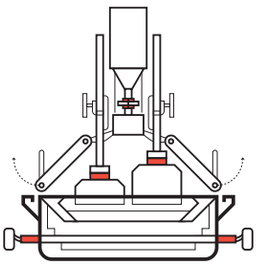


TUBESHEETS

Transition Joints



STRUCTURAL



ELECTRICAL

CRYOGENIC

NobelClad specializes in solutions that redefine metals fabrication, from extremely large area plates used for pressure vessels and pipes to custom formed shapes, like heads.

Extraordinary Capabilities. Endless Applications.

The following are a few real-world examples of how NobelClad has solved complex metal challenges by relying on the strength, versatility, and dependability of our materials.

Bend But Don't Break

NobelClad plates can be formed into precise shapes. No matter the geometry the engineer calls for, our material won't disbond, as can happen with formed roll bonded metals. These capabilities make NobelClad invaluable to complex design challenges.

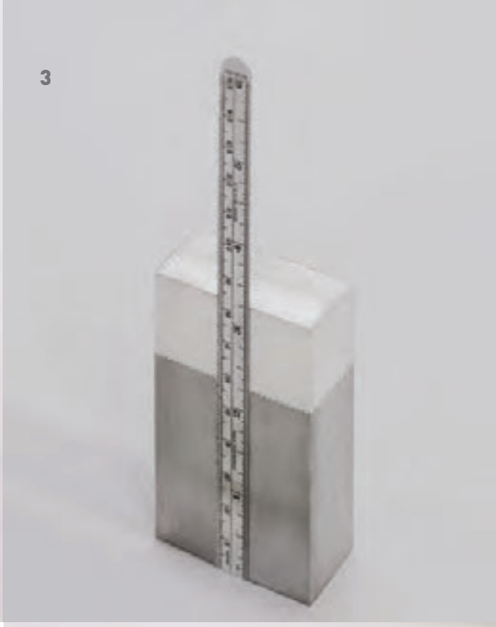
We collaborated on one of the largest natural gas projects in the world. The Gorgon Project was the single largest resource development ever on the Australian continent, and its multimillion-dollar slug catcher resulted in NobelClad providing over 6100m² of clad plate for pipes. The manifolds of the Gorgon slug catcher required a unique forming process that involved extreme deformation of the clad. DetaClad™ is the only clad material that is proven not to fail as a result of this process. The managers of the project were confident in working with NobelClad due to our materials' reputation for withstanding complex metal forming and our reliability when it comes to high-stakes projects.

OPPOSITE

1 Before and after: 600mm of billet extrudes into over 6m of clad pipe.
2 In a simulated pressure test, not only did the aluminum pipe fail before our cryogenic transition joint (CTJ) failed, the pipe failure occurred at greater than 4 times the design pressure.
3 Thick, high-strength clad: 25mm alloy 625 clad bonded to carbon steel.
4 Cross-section of an extruded manifold that enabled the success of the Gorgon Project.
5 CTJs can be made in virtually any diameter, from just a few dozen millimeters to over a meter.
6 Joining zirconium (Zr) clad vessels: Zr bonded to carbon steel in a simulated HAZ for welded batten straps.
7 On a daily basis, we expertly bond a variety of both similar and dissimilar metal types, such as this sample of titanium, aluminum, and carbon steel.

BELOW

On most alloy systems, the weaker of the two base metals will break before our bond.



DIRECT ATTACHMENT

The World's Most Powerful Bond

Clad vessels often require attachments to vessel walls. DetaClad™, produced exclusively by NobelClad, allows you to attach heavy and light internal components directly to our clad. In most forms of cladding, it is necessary to strip back the surface metal first. NobelClad eliminates the strip-back and restoration process, saving hundreds of thousands in costs per vessel, decreasing fabrication time, and adding flexibility to your designs.

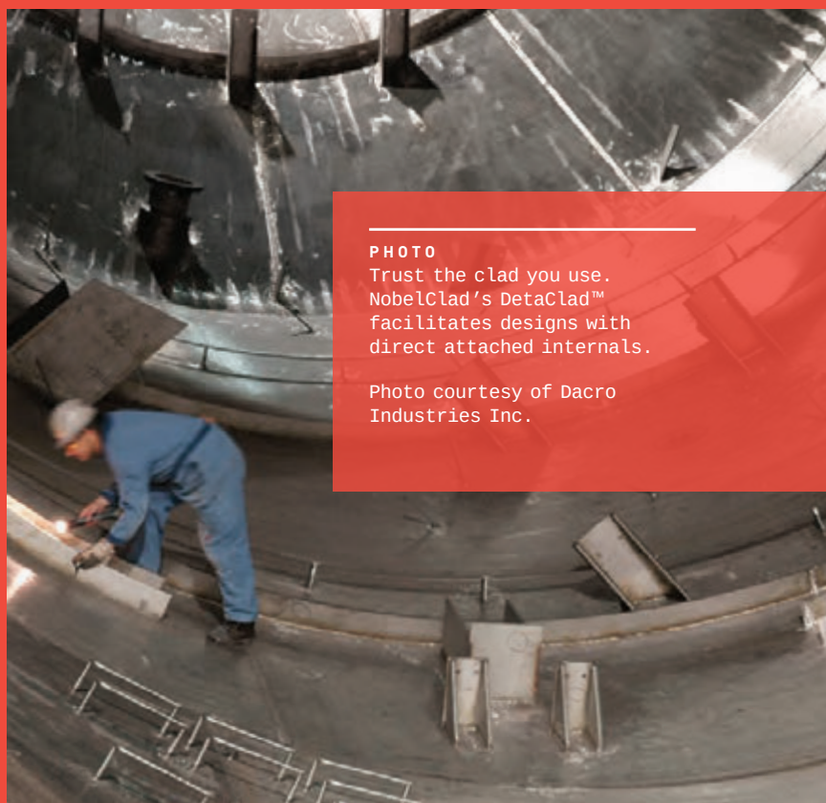


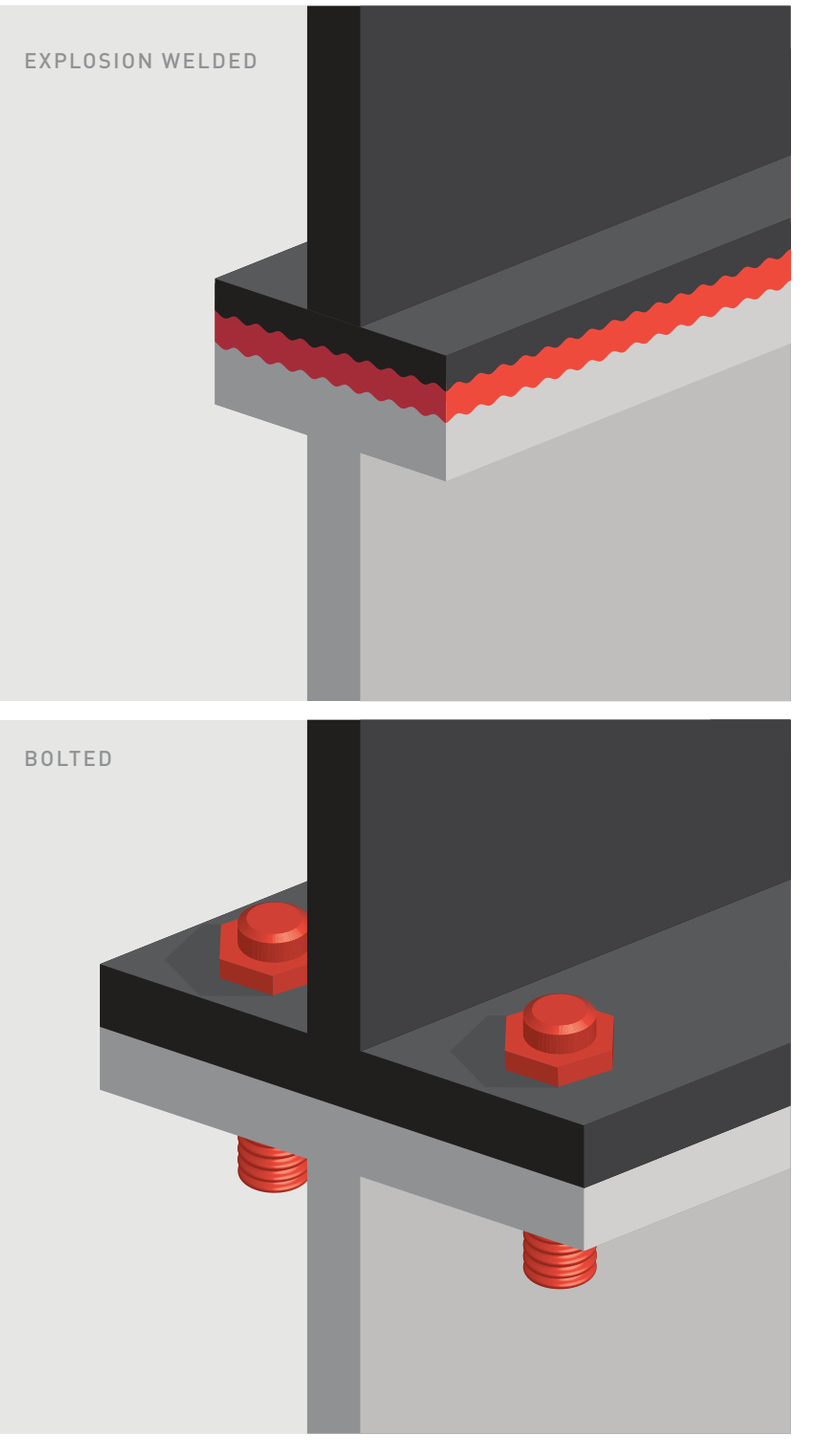
PHOTO
Trust the clad you use. NobelClad's DetaClad™ facilitates designs with direct attached internals.

Photo courtesy of Dacro Industries Inc.

Making Better Connections

For over 100 years, rivets/bolts and insulators/isolators were the most reliable method for joining dissimilar metals. Since NobelClad perfected explosion cladding, our method has proven to be a far superior joining technology. The major shortcomings of rivets and bolts are that they require holes to be drilled, need special insulators, and require regular assembly inspection. Any removal of material, such as drilling holes, also weakens the metal. Explosion welded structural transition joints are an indisputably better option because they eliminate crevices and have been shown to limit crevice corrosion. Transition joints require no extra hardware, which allows engineers to streamline their designs and shave off extra weight.

NobelClad has worked with a leading train manufacturer to use clad transition joints to connect aluminum and steel structures in train car bodies. Structural transition joints also work well in shipbuilding to connect steel hulls to aluminum superstructures. The result is increased reliability and longevity, and lower production times and costs, than if mechanical fasteners were used.



OPPOSITE
Lighter, better: trains made with explosion welded transition joints.


LEG

Our Clad Is Fail-Proof

For offshore projects, where space is limited and regular maintenance is not an option, design and fabrication have to be perfect the first time. NobelClad played an integral role in the Wheatstone Project, an offshore platform. The Wheatstone engineers required clad that could handle the stress of numerous precise piping bends without disbonding. The oil platform had to be able to withstand the worst nature can throw at it, including seismic activity, king waves, and catastrophic events. For our partners on this project, NobelClad was the clear choice due to our extensive experience and our ability to work through any challenge and finish the job quickly.

Our explosion welding techniques allow fit-and-forget applications, which were crucial to the Wheatstone Project.

We are so confident in our clad that we offer a guarantee: **When properly formed and fabricated, our products will not disbond or we will replace them for free.**

LEFT
The harshest environments demand the best clad.

NOBELCLAD'S EXPLOSION WELDS PRODUCE SOUND METALLURGICAL BONDS WITHOUT REPAIR AT A RATE OF 99.999%.

Global Reach, Enormous Capabilities.

NobelClad is well equipped to produce anything from thin, small plates to the largest clad plates manufactured. Our industry-leading capacity to make extremely large plates can pay off for our partners. Bigger plates require fewer welds and can be incredibly cost-effective. In the interest of keeping large projects supplied with a consistent stream of clad plates, NobelClad has the ability to scale up our operations. We have strategic resources across the globe that we deploy into action on demand.

NobelClad partnered on a greenfield project to set up potash production in Saskatchewan, Canada. This endeavor, called the Legacy Project, required NobelClad to ramp up production in order to meet the project timeline. Our operations generated nearly 700 plates in 5 months (6500m²). The work moved through our production facility without disturbing or displacing our other customers' orders.

NobelClad is a global operation, with localized management and manufacturing around the world. We work with partners across the supply chain to make sure sourcing, engineering, fabrication, and delivery are all done in the most efficient and cost-effective way possible. We invest in global operations because we know they are mission critical to our partners' highly sensitive industrial projects.

No matter the timeline or dimensions of the project, each client gets our undivided attention, problem solving, and expertise, every step of the way.

MAP

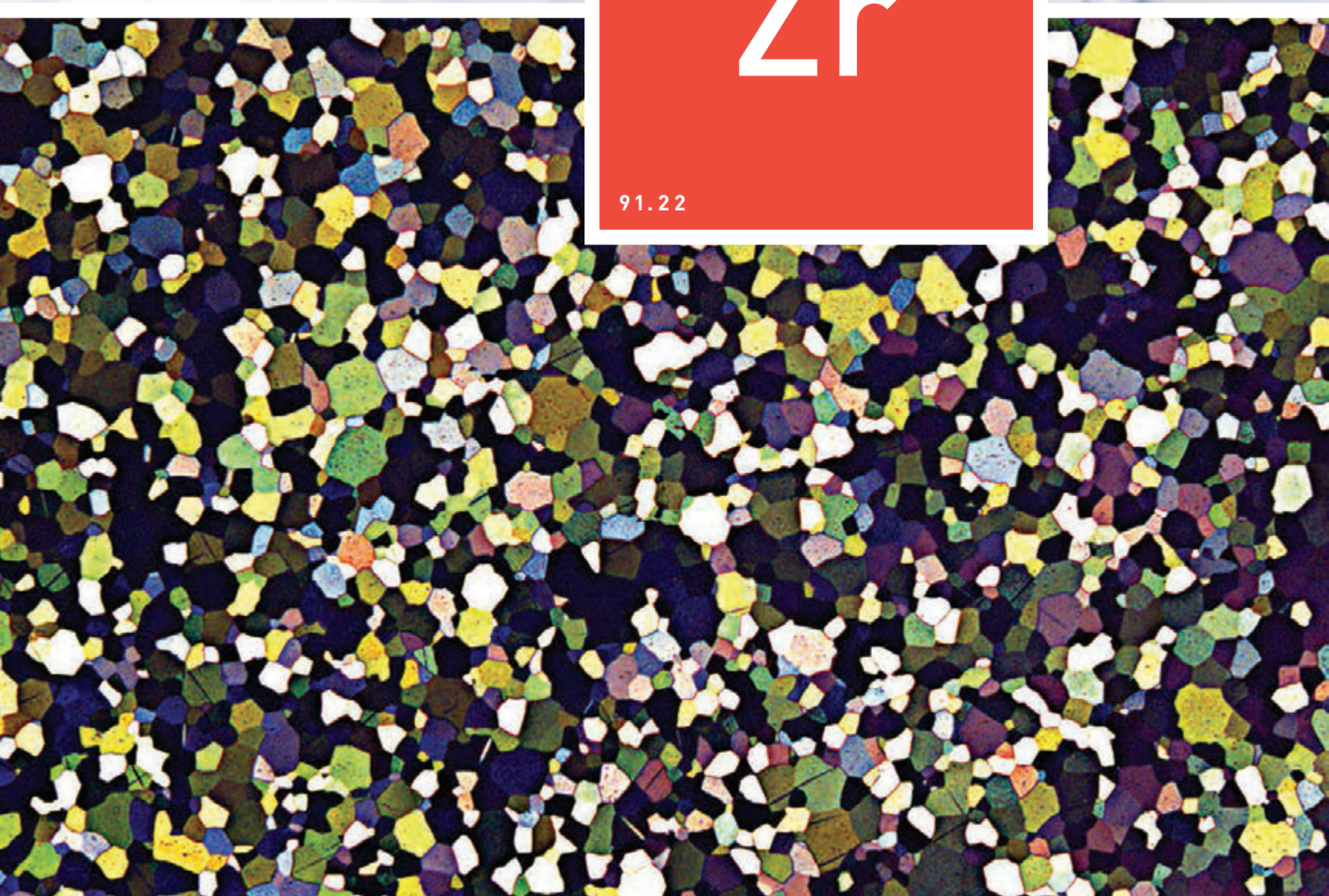
- NobelClad Sales Offices & Production Centers
- Other DMC Facilities

NOBELCLAD MADE THE LARGEST CLAD PLATE ON RECORD, WITH A SURFACE AREA OF OVER 42 SQUARE METERS (450 SQUARE FEET) AND WEIGHING IN AT 24,000 KILOS (53,000 LBS).

40

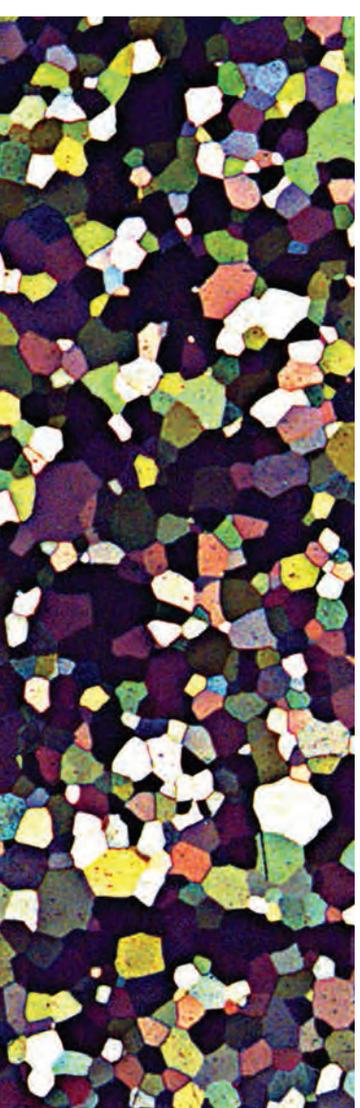
Zr

91.22



Mastering Zirconium

Zirconium (Zr) is a robust material when it comes to corrosion resistance over a broad range of chemicals, but it is notoriously hard to work with. NobelClad has pioneered work with zirconium for 30 years in order to make Zr clad a reality. By working closely with engineers, mills, and manufacturers, NobelClad researchers have made revolutionary advancements in metalworking. In addition to simply learning how to manufacture Zr clad, NobelClad worked with partners to develop the fabrication techniques, the ASTM Specification B898 for reactive metal clad, and a grade of zirconium specifically designed for NobelClad. Zr clad has become the standard for acetic acid pressure vessels all over the world. This revolutionary product and process wouldn't have been possible without strong collaboration between NobelClad and our industry partners.



BOTTOM
Zirconium microstructure viewed at 50x magnification.

Photo courtesy of ATI.

Looking Ahead.

NobelClad continually blends technical proficiency with creative genius to envision and develop new potential applications for clad.

MITRE GATES

Lock gates on canals already employ clad to bond corrosion-resistant metal to steel at crucial places like hinges.

OFFSHORE PLATFORMS

Helicopter decks can be directly welded to offshore vessels using explosion welds instead of bolts.

TRANSPORTATION

Auto, aerospace, and even recreational vehicles could benefit from the strength and relative weight of transition joints.

ART & ARCHITECTURE

The unique visual characteristics of explosion clad material has also lent itself to exploration in art and architecture.

WE'RE EXCITED TO SEE WHAT THE FUTURE HOLDS FOR THIS GREAT TECHNOLOGY. WE'RE EVEN MORE EXCITED TO COLLABORATE WITH YOU TO MAKE THESE INNOVATIVE APPLICATIONS OF CLAD A REALITY.

JOIN US IN MAKING THE NEXT GENERATION OF CLAD A REALITY.

LEARN MORE
www.explosionclad.com

QUESTIONS?
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DMC is a growth company focused on building a family of technical product and process businesses for the global energy, industrial and infrastructure markets.

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