ABOUT DETCLAD® ZIRCONIUM CLAD PLATES

NobelClad uses its explosion welding process to manufacture Zirconium clad plates used for the production of reactors, columns, heat exchangers, cooler-condensers, reboilers, distillation columns, storage tanks, tubesheets and related chemical process equipment. Zirconium cladding is often used when corrosion properties are required that cannot be achieved with other lower cost alloys for pressure vessels and heat exchangers in the production of:

- Acetic Acid [AcOH]
- Adipic Acid
- Ammonium Nitrate [AN]
- Ammonium Carbamate
- Azo Dyes
- Cellulosic Ethanol
- Hydrogen Peroxide \( \text{H}_2\text{O}_2 \)
- Methacrylic Acid [MAA]
- Methyl Methacrylate [MMA]
- Propylene Oxide \( \text{PO} \)
- Nitric Acid \( \text{HNO}_3 \)
- Urea

Zirconium is a preferred material for highly corrosive chemical processes including hot, concentrated hydrochloric acid, sulfuric acid and nitric acid. Amongst the reactive metals, Zirconium is unique in its ability to withstand host concentrated alkalis and has been used in applications such as hot caustic as well as environments which alternate between acids and alkalis.

ADVANTAGES OF DETAACLAD®

Explosion welding (EXW) is a cold welding process that maintains the corrosion properties of the clad materials. Zirconium clad is not available via roll bonding or weld overlay. Commercially pure (CP) grades of Zirconium, including the Zr700 and Zr702 grades can be clad to carbon steels, alloy steels, stainless steels, aluminum alloys, copper alloys, titanium alloys, nickel alloys and other backing materials. Some combinations may require an interlayer. Advantages of Zirconium clad plates include:

- Production of identical size plates for large projects as well as custom sized plates in small quantities for special needs.
- Optimally-sized Zirconium clad plates can be produced to minimize the amount of welding needed for large vessels.
- Use of pre-welded Zr700 sheets prior to cladding allows for plate sizes, i.e., up to 2.4m x 6m or larger, which are significantly larger than Zr-clad plates commercially available elsewhere and twice as large as those available for Zr702 clad, i.e., up to 2.4m x 3m.
- Plates can be clad on both sides with Zirconium when there is a need for inside and outside corrosion protection.
- Single piece or segmentally formed heads of clad zirconium can be produced by NobelClad and its partner companies.
- Multi-layer clad plates can be produced for transitioning from Zirconium to other alloys.
Specifying Zirconium Cladding for Chemical Process Equipment

Although Zirconium cladding is often specified using the least restrictive criteria in ASTM B898, higher levels of clad quality are often needed for many types of chemical process equipment. NobelClad’s Zirconium clad plates are commonly provided in two configurations:

- Zr700 direct clad to base metal (2-layer): generally the most economical option allowing for the largest plate sizes and the shortest lead time
- Zr702 clad to base metal with a Titanium Grade 1 interlayer (3-layer): for equipment that requires > 9.5mm (3/8”) thick zirconium cladding, e.g., heat exchanger tubesheets

The following requirements should be specified to ensure the explosion bonded Zirconium plates have high bond strength and excellent bond quality so that forming and rolling processes can be performed without the danger of disbonding:

- **Bond Shear Strength**: A minimum shear strength of 140 MPa (20 ksi), or higher shall be verified after all clad processing is completed, including a simulated post weld heat treatment (SPWHT).
- **Ultrasonic Testing (UT)**: A 100% scan of all plates shall be performed according to Class A criteria in ASTM B898
- **Clad Layer Thickness**: A 9-point thickness inspection shall be used to verify that minimum clad layer thickness has been achieved on each plate. Clad thickness measurements shall be performed after all after final surface grinding/polishing is completed.