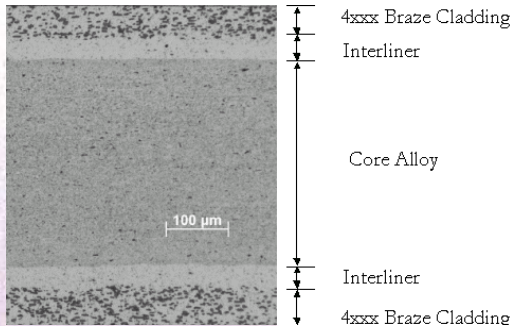




Multi-Layer Clad Products

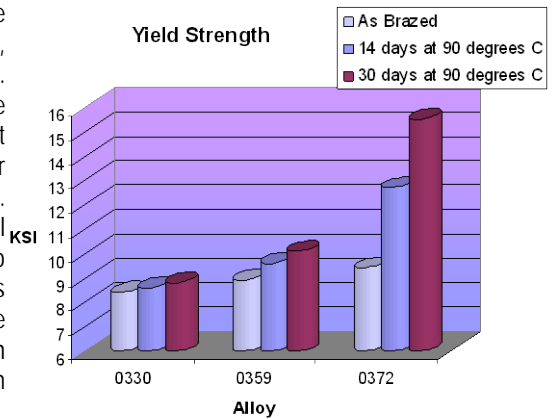
With the addition of multiple clad layers (more than three) highly engineered solutions to difficult problems, such as corrosion resistance and high strength, can be produced. Currently, Alcoa has developed both four and five layer clad products, each exhibiting unique properties from alloy selection and clad ratios.



The photomicrograph in the figure to the left illustrates the several different materials in a multi-layer clad product. The material choices impart different properties on the total structure. For instance, interliners can be made without copper additions or with zinc additions to increase corrosion resistance of the structure. Another potential for controlled atmosphere brazing applications features the interliners as diffusion barriers for magnesium, allowing higher strength magnesium bearing alloys to be used in demanding conditions.

High Strength CAB Applications

Multi-layer structures enable controlled atmosphere brazing of aluminum alloys containing magnesium, an important element in aluminum strengthening. The graph to the right illustrates how Alcoa core alloys with increasing levels of magnesium exhibit increasing strength. With some core alloys further strengthening in use occurs due to age hardening. Multi-layer structures are essential to the successful brazing of magnesium bearing core alloys. To prevent the magnesium from hindering the flux's ability to successfully remove oxides from the surface for brazing, the interliners act as diffusion barriers to the magnesium, minimizing magnesium interference with the action of the flux.



The picture to the left demonstrates this property well. The evaporator to the far left used interliners on a core alloy with 0.25 percent magnesium by weight. This evaporator brazed successfully with no skips at a flux loading of 6 g/m². The evaporator on the close left was brazed in the same furnace at the same time with the same core magnesium level (0.25 percent by weight) at a higher flux load but with a conventional three layer composite. It failed to successfully braze as evident in the numerous skips and thin fillets.



Interliner (no skips at 6 g/m²)

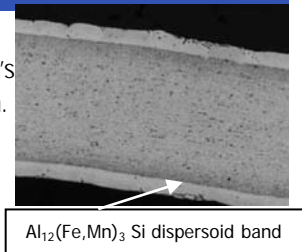
No Interliner (numerous leaks at 10 g/m²)

Corrosion Resistance



Five Layer 3003 Modified

The Alcoa multi-layer structures feature multiple corrosion resistant mechanisms for exceptional corrosion resistance. In addition to aluminum's inherent corrosion resistance, each layer contributes to galvanic protection. The residual braze liner and the interliners can be anodic to the core alloy. Also, diffusion of silicon through the interliner into the core during brazing precipitates dispersoids and creates a "brown band" manganese-depleted anodic zone. (See picture right). Additionally, Alcoa proprietary long life alloys form titanium rich lamellar bands to divert pitting corrosion laterally.



Al₁₂(Fe,Mn)₃ Si dispersoid band

The three sample parts to the left were brazed and then subjected to corrosion testing (SWAAT) for 30 days to demonstrate the advanced corrosion resistance achieved with the multi-layer system.

The high purity interliners in the five layer alloy established an anodic galvanic potential to the core alloy to completely protect the part from perforation. In comparison, the 0359 corrosion resistant alloy showed a considerable amount of dissolution and some perforation by corrosion. The modified 3003 alloy shows extreme dissolution and perforation, with part of the plate completely dissolved.

Product offerings are subject to change without notification.

Please contact your Alcoa representative for assistance to help evaluate your individual needs.

ALCOA MILL PRODUCTS

1480 Manheim Pike Lancaster, PA 17601 Ph: 800-233-0481 Ext:1243

www.brazingsheet.com

v2.01

Verseci u. 1-15. POB. H-8000 Szekesfehervar, Hungary Ph: 0036-22-53-1446

AMP#194R-C

10/01

No. 111, Yanhu Road, Huaqiao Economic Development Zone, Kunshan City, Jiangsu Province, P.R. China, 215332 Ph: 0086-512-5769-8817

