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### **Titanium Corrosion Markets**

An update on field trials using platinum group metal applique (PGMA) to boost the chemical resistance of titanium was the highlight presentation on corrosion market applications at Titanium 2008, the 24th annual conference and exhibition held Sept. 21-24 at Caesars Palace, Las Vegas. The International Titanium Association (Web site: [www.titanium.org](http://www.titanium.org)), Broomfield, CO, sponsors the event.

Projections by conference speakers were compiled just prior to the full realization of the unfolding global economic meltdown, which creates a considerable degree of uncertainty for all business sectors.

James Grauman, applications development manager with Dallas-based Titanium Metals Corp. (Timet), said field trials of titanium using PGMA currently are underway for chemical processing industry (CPI) applications. The focus involves a minor use of PGMA (0.02 percent) to significantly enhance and stabilize titanium's oxide film formation.

Once a titanium grade is polarized with the applique (titanium grades 2 and 7 are under review), metal corrosion rates in nitric-acid CPI environments are said to drop more than 100 fold, according to Grauman. The appliques are not alloyed, but rather applied to the titanium substrate via plating, fusion and resistance welding or mechanical fastening. Grauman noted that because the PGMA is not alloyed with the base titanium, the cost of using a surface agent, like palladium, drops dramatically. This point is significant as palladium weighs in at \$325 an ounce (as of September 2008). In addition to new systems, PGMA surface enhancement can be extended to retrofit or repair existing systems.

While various PGMA are being explored to boost the corrosion resistance of titanium, palladium has emerged as the top choice for these applications. However, there is flexibility to use the spectrum of PGMA and the selection can be dictated by market prices as well as the level and type of CPI corrosion resistance needed.

Grauman reported there are several full-scale field trials under review to test the corrosion benefit of PGMA, including the corrosive section of a distillation column exposed to halide acid; pipe used in an "aggressive organic" process stream; and a high-temperature pressure vessel for high concentrations of mineral acid.

John Williams of Mogas Industries Inc., Houston, a supplier of severe-service, metal-seated ball valves, described how titanium has become the workhorse material for the pressure-acid leach (PAL) and pressure oxidation (POX) processes used in the commercial extraction of nickel, gold, copper and cobalt from ore. Titanium, Williams said, has become a material of choice for valves, autoclaves and piping (compared with duplex stainless steel) given its superior corrosion-resistance properties. System components in the PAL and POX processes face exposure to sulfuric acid and operating temperatures in excess of 500 F.

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