

Aluminations

The Quarterly Newsletter of AlumiPlate, Inc.

Plating With Aluminum

Optics - SPIE 97 Attendees Show Great Interest

As many of you who are involved in the optics world already know, AlumiPlate, Inc. exhibited at the SPIE (Society of Photo-electronic Instrumentation Engineers) Annual Meeting in San Diego this past July. This was AlumiPlate's first exhibition at an optics trade show and was our first real opportunity to meet and discuss the possibilities that Plating With AluminumSM brings to the end users, system integrators and optical design engineers.

The SPIE annual meeting was very well attended with about 6,000 people in San Diego for the technical presentations and the exhibits. Many of you stopped by our booth to see, in some cases for the very first time, the results of diamond turned AlumiPlateTM aluminum on metal mirrors. Many took home 1" aluminum plated and flycut witness samples provided by **OFC of Keene, NH** for further inspection. Having generated so much excitement, we thought it important to share some of the highlights of the week with you.

To review for our newer readers... "Optics" means different things to different companies. To AlumiPlate, it means plating of our high purity aluminum onto metal mirrors used in high end optical platforms such as airborne, spaceborne and ground-based infra-red (IR), visible spectrum and multi-spectral applications. AlumiPlateTM aluminum is an excellent surface to diamond machine and can save significant time and money in the manufacture of aspheric and other metal mirrors. AlumiPlate aluminum can be diamond machined to a surface finish of 20-40 Angstroms rms. In most cases, other mirror substrates - either base materials (such as 6061-T6 aluminum, beryllium or silicon carbide), or plated materials (such as electroless nickel) require polishing after diamond machining to achieve a <50 - 70 Å rms surface.

Over 75 metal mirror specifiers stopped by the AlumiPlate booth to discuss surface finishes possible on the diamond turned layer as well as the layer's unique ability to resolve thermal expansion-induced warpage problems associated with bi-metallic mirrors.

Company representatives visiting AlumiPlate at SPIE included people from:

Ball Aerospace, Bushnell, Hughes, Jet Propulsion Lab, NASA, Naval Air Warfare Center, Raytheon, TI Systems, Lockheed-Martin, TRW,

Brookhaven N.L., Lawrence Livermore N.L., Naval Research Lab, National Optical Astronomy Observatories, Smithsonian Obs., Steward Observatory Universities - Alabama, AZ, Auburn, MIT, Politecnica de Madrid, de Liege (Belgium), CA at San Diego, Hawaii, Virginia

Comments & Thoughts included:

- "A significant disadvantage of nickel plating is the difference in CTE between the most common plating material, electroless nickel, and metal mirror substrate materials"
- "Figuring of nickel-plated 6061 is difficult due to thermal expansion properties.."
- "The possibility of constructing an all-aluminum optical system may just have become a reality."
- "I see a lot of applications for space based platforms, what kind of performance can be expected at low temperatures (below 65°K)?"

AlumiPlate: *Space-based or high precision IR instruments many times must operate at "cryogenic" (~65° K) temperatures or during severe temperature fluctuations. Similar coefficients of thermal expansion (CTE) of AL6061 mirrors and a diamond turning layer of AlumiPlate high purity aluminum may make AlumiPlate aluminum the plating of choice for some applications that require minimized bimetallic warping. Watch for results here.*

Technical Questions included:

- 20 to 40 Å rms from diamond machining is great on flats. What kind of results can be expected on off-axis aspheres?
- AlumiPlate:** *We're not sure yet, but we would expect aspheres to be a more rigorous test. Several customers are evaluating the results on off-axis aspherical mirrors. While much of this work is proprietary, some will soon result in publishable data and we will report these as soon as they are available.*

- What other test results do you have?

AlumiPlate: *Many thanks to **Jim Wing of Precitech** who provided AlumiPlate with an outstanding 20 angstroms rms diamond turned surface finish on a three inch diameter 6061-T6 convex display piece with 0.005" of AlumiPlateTM High Purity Aluminum. Others have fly cut to 35 - 45 Å on aluminum plated witness samples with their equipment set up just as they would to run 6061. For a color surface finish map of a diamond turned AlumiPlate sample, contact the company.*

Price Improvements

As many of our customers know, AlumiPlateTM Aluminum is not an inexpensive coating. It is however one of the highest performance coatings that is commercially available. For two years since we began plating aluminum, we have been gathering information and comparisons between the performance and pricing of AlumiPlate aluminum and other coatings.

We know that aluminum plating performs better than virtually any other plating in corrosion resistance testing and does so with far less free hydrogen than aqueous plating methods. The diamond turnability of aluminum plating is superior to that of electroless nickel. No other plating enables anodization over an unanodizable substrate.

It has always been our intention to reduce the cost of Plating With AluminumSM to a level that will compete favorably with other commercially available high performance technical platings. Long term, we are committed to making AlumiPlate aluminum a best life cycle cost solution.

As we scale up our aluminum plating capacity and improve the throughput that we are able to achieve, we will periodically be introducing price improvements. Long term we see the potential for dramatic price reductions from today's levels for certain applications.

This long term scale up will take fairly large capital equipment outlays and a couple of years to accomplish. But it is important to note that we are confident that we WILL accomplish this long term pricing improvement in the foreseeable future while running a profitable business.

To that end...

AlumiPlate, Inc. is pleased to announce that we have instituted a price improvement of 20% as compared to previous pricing. This change will be in effect for any production or budgetary quotes made after October 1st. **Give us a call!**

Visit us at ASPE Booth #23

The AlumiBuzz...

Applications Update

Our customers and prospects continue to guide us toward the highest value applications for

AlumiPlate aluminum. Very good progress is being made including an increasing awareness in the marketplace of the value that AlumiPlate aluminum can add, increased focus on highest value applications, and more penetration of our focus markets...

Critical Fasteners

Use of Belleville Conical Disc Springs for Live Loading of Flange Connections and Control Valve Stems in Petro-Chemical Plants Benefits from Corrosion Resistance and High Temperature Resistance of AlumiPlate Aluminum Plating.

Throughout the petrochemical and oil refining industries, there is an increased push for eliminating fugitive emissions from valves and flange connections. This trend will most likely lead to increased use of live loading techniques and technology; and could very well mean increasing the use of higher performance Belleville conical disc springs. Because of the harsh environments in which these springs are applied, corrosion of the springs and hydrogen induced stress corrosion cracking and embrittlement of high strength spring steel alloys are major design considerations. Humid coastal regions (chlorides) with industrial atmospheres (sulfur dioxide) are extremely corrosive environments. The intermittent high temperatures (300 - 900° F) can accelerate the corrosion.

Would-be Belleville users are stuck using higher cost, corrosion resistant yet lower performance (lower spring force) alloys such as 17-4 PH Stainless or Inconel as spring materials and having to oversize their springs to accommodate the lower strength materials.

Traditional plating cannot be used reliably to protect high strength steel alloy springs due to fears of process-induced hydrogen embrittlement that can be caused by aqueous plating processes.

One of the best ways to overcome this problem is to protect these critical springs with a thin, highly corrosion resistant, dense metallic aluminum layer that is ductile (will not flake or peel when flexed) and will withstand high temperatures. AlumiPlate aluminum has excellent corrosion resistance properties in chloride and sulfur dioxide-rich atmospheres.

The AlumiPlate aluminum plating process currently includes some minimal aqueous cleaning and deoxidation steps prior to the non-aqueous aluminum plating step where no free hydrogen is present. Hydrogen embrittlement testing, which to date has been limited, is ongoing and we are working toward building a more exhaustive test database as well as the elimination of all aqueous processing steps in the process. **Contact AlumiPlate for details!**

Thermal Management

AlumiPlate™ Aluminum Enables Brazing and/or Anodizing of Beryllium and SiC-containing Alloys and Metal Matrix Composites.

Heat sinks, thermal planes, SEM-E modules and racks, and other electronics packaging and enclosures commonly need to have dual functions. Besides providing a path for heat conductance, they must protect the electronic circuitry from rough field handling and the environment. **Corrosion resistance, wear resistance, light weight and brazability are all critically important properties that these components should have for many applications.**

The AlumiPlateSM aluminum plating process facilitates the use of materials such as Copper, Beryllium-Aluminum, AlSiC (Aluminum Silicon Carbide) and other materials that are difficult or impossible to anodize repeatedly or to braze to each other or to other components. By plating these materials with aluminum, fabricators can now anodize the surface of the parts - giving them a black (*or any other color*), wear resistant surface. The high purity aluminum plating can also facilitate the **vacuum brazing** of these components.

Update on ALMMCC

We received a number of requests for further information about the Aluminum Metal Matrix Composite Consortium (ALMMCC) that we mentioned in the last *Aluminations*. This new organization promotes the uses and manufacturability of aluminum metal matrix composites. **A kick-off meeting for the consortium will be held October 21 & 22, 1997 in Dayton, OH.** The ALMMCC can be contacted at:

Dr. Warren Hunt
Interim Executive Director
 Phone: 412.733.1823
 email: acgroup@usaor.net

AlumiPlate to Exhibit at ASPE '97

This year, AlumiPlate will be exhibiting at the **American Society of Precision Engineers** annual meeting in Norfolk, VA to be held **October 6 - 9th**. AlumiPlate will again have diamond-turned witness samples available for inspection. The ASPE conference brings together leaders in the fields of optics, microelectronics, nanomechanics and precision machining. It is an excellent show and technical conference enabling us to increase awareness of the AlumiPlateTM aluminum layer within the diamond machining community and learn about other high value customer applications.

Upcoming Events

Photonics East '97 - Sept 22-24, '97 - AlumiPlate will attend the eastern regional optics show in Boston.

ASPE '97 - Oct 5-7, '97 - AlumiPlate will exhibit at the Am. Soc. of Precision Engr. Annual meeting and conference in Norfolk, VA.

OSA '97 - Oct. 12-17, '97 - AlumiPlate will attend the Optical Society of America's annual optics conference in Long Beach, CA.

ISHM/IMAPS '97 - Oct. 12-17 - AlumiPlate will attend the International Microelectronics and Packaging Society annual conference in Philadelphia, PA.

Fastening Expo '97 - Oct. 23-24, '97 - AlumiPlate will attend the fastening conference in Novi, MI.

SMI Fall Conference - Oct. 19-21, '97 - The Spring Manufacturers Institute meeting will be held in Palm Springs (nice pun), CA.

The AlumiPlate Lair

Business at AlumiPlate, Inc. has been progressing well over the last quarter. Sales continue to reach record levels. We have seen increased interest from the international markets which hold a very high potential for us.

More progress has also been made in the operations of the business. Our lead times have been reduced, but not yet to the levels we would like them. Internally, we are implementing our state-of-the-art order entry and management system.

Final Rinse - Want to send an email? email directory

Our convention is name@AlumiPlate.com
 Bryan Fuhr - VP Sales and Mktg - [bfuhr@](mailto:bfuhr@AlumiPlate.com)
 Gus Vallejo - Inside Sales Mgr - [gvallejo@](mailto:gvallejo@AlumiPlate.com)
 Sandy Donaldson - Mktg - [sdonaldson@](mailto:sdonaldson@AlumiPlate.com)
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 Dave Swenson - Controller & MIS - [djswenson@](mailto:djswenson@AlumiPlate.com)

Feedback Loop

Got any comments on how we're doing? Any comments or suggestions are welcome. **We always want to know what you think.** From the plating on your parts to the pricing of our services to our web page - **give us a call or drop us an email!**

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