Upcoming Events

NAMBE 2011
August 14-17,
San Diego, CA
Website

AVS 58
Oct. 30-Nov. 4,
Nashville, TN
Website

Event Calendar

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Conference Reports

ICMCTF 2011

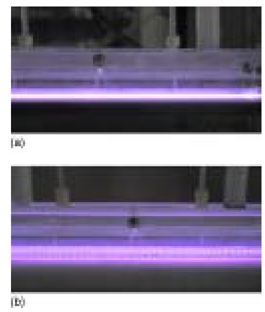
May 2-6, 2011
San Diego, California

The International Conference on Metallurgical Coatings and Thin Films (ICMCTF), organized by

Recently Published

Status and Potential Atmospheric Plasma Processing of Materials

Daphne Pappas, Ph.D., United States Army Research Laboratory

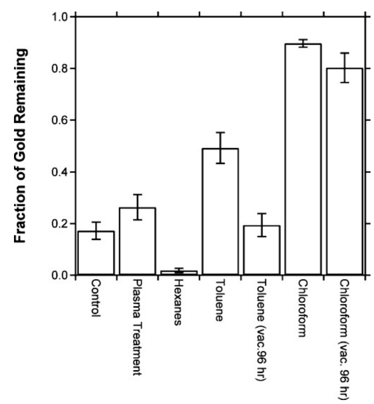


In the past decade, atmospheric plasma processing of materials has attracted a lot of attention, especially as it can be considered a new, "green" method to modify and coat the surfaces of a variety of materials. This article in the July issue of JVST A summarizes the developments in this technological area, from Siemens' discovery of ozone production in 1857 to the micron-size patterning of biomaterial scaffolds for controlled cell growth in 2010. It provides a brief description of the most popular equipment used for atmospheric plasma modification of materials and discusses the role of the gas phase energetic species.

The article also presents a literature review on the plasma assisted deposition of organic and inorganic coatings, inactivation of biological agents, functionalization and surface patterning, pollution and waste control using atmospheric plasmas. **Read More**

return to top

Chloroform Helps Stick Gold to Polymer Substrates



Polymer substrates for electronic chips are promising for everything from solar panels to flat screen monitors to biosensors because they are cheap, durable, and easy to manufacture. However state-of-the-art performance with polymer-based electronic devices is best achieved by using thin films of metal such as gold to form the electronic interconnections. Therein lies the rub - it's hard to get a mostly inert metal like gold to stick to plastic.

A variety of techniques exist to get the gold to stick, and they largely come down to two general approaches: either first apply a thin adhesion layer of reactive metals that bond to both the polymer and the gold - or modify the surface of the polymer with chemicals, plasma or radiation so that gold sticks to it.

None of these approaches are optimal, said Brian Augustine, PhD, and the AVS Advanced Surface Engineering Division (ASED) featured 58 technical sessions, 89 invited speakers, 640 oral and poster presentations from 30 countries, a premier equipment exhibition, three focused topic sessions, and four short courses. Since the conference's inception in 1974, ICMCTF has been a leading international forum for the coating and thin films fields.

This year's program continued the strong tradition of promoting a truly global exchange of information among scientists, technologists, and manufacturers for science and technology of thin film deposition, surface modification, and characterization.

The conference opened on Monday morning with a Plenary Lecture by Dr Joe Greene, University of Illinois, Campaign-Urbana, Illinois, entitled "Fundamental Properties of TM Nitrides and Design Strategies for Growth of Self-Organized Nitride Nanostructures."

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Christopher Hughes, PhD, of James Madison University in Harrisonburg, VA, because many of them can damage the surface of the substrate. Those that do work moderately well, like plasma treatment, can be expensive.

Last year, Augustine, Hughes and their students found a way to improve on these existing techniques while designing a microfluidic device for performing rapid DNA amplification in tiny volumes of liquid. Their device uses infrared light to cycle the temperature of drops of liquid containing DNA and reagents, and having gold in the device is key because it enables the path length to be doubled.

Not satisfied with existing techniques for sticking gold to polymer substrates, they developed a side project to see if they could improve the bonding of gold to a widely-used polymer known as polymethyl methacrylate (PMMA). What they discovered was a relatively easy and inexpensive way to improve the adhesion of gold films onto polymer substrates.

The procedure is simple: simply spin cast chloroform onto the polymer surface and then let the solvent evaporate in a vacuum chamber before metal deposition. Their simple method results in nearly 90 percent adhesion of an array of circular gold dots - compared to 17.2 percent adhesion for a cleaned PMMA sample and 26.3 percent adhesion for an oxygen plasma treated sample.

Unexpectedly, said Hughes, the secret turned out to be the solvent used. "It was the chloroform that caused the improvement," he said. They are now trying to clarify the mechanism behind the adhesion, which they believe to be due to the orientation of the chlorinated part of the solvent molecule, which bonds favorably to both the polymer and a thin adhesion layer made of chromium, and in turn to the gold atoms

One interesting feature of the research was the fact that it was conducted largely by a team of undergraduates advised by Augustine and Hughes. Alan K. Mo was a student at James Madison University; Vezekile P. Zungu was a student at the University of KwaZulu-Natal in Pietermaritzburg, South Africa; and Laura L. Lee was attending High Point University in High Point, North Carolina. All were part of a NSF-sponsored program at James Madison, called Research Experience for Undergraduates, which enrolls dozens of materials science and engineering students each summer to work full-time on projects like this.

The article, "Improving the adhesion of Au thin films onto poly (methyl methacrylate) substrates using spun-cast organic solvents" by Alan K. Mo, Thomas C. DeVore, Brian H. Augustine, Vezekile P. Zungu, Laura L. Lee, and Wm. Christopher Hughes appears in the May/Jun 2011 issue of JVST A.
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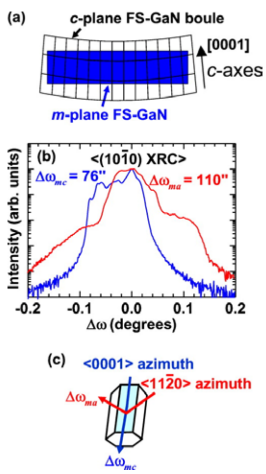
return to top

Eliminating Mosaics--A Step Toward UV and White LEDs



True white and powerful ultraviolet light-emitting-diodes (LEDs) are modern examples of applications in search of an underlying technology--light sources whose promise is matched only by the challenges faced in developing them.

With LEDs that emit high-energy UV light will come long-lasting, energy-efficient sources for everything from water purification systems to new biomedical treatments. Moreover, enrobe them in the yellowish tinge of a phosphor, UV LEDs could also provide a pleasing bright white indoor glow that could be carefully matched to the natural wavelengths of sunlight--all in a tiny, solid-state packaging that would use a fraction of the energy needed to run conventional incandescent bulbs.

Yet major manufacturing hurdles must be overcome for this type of lighting before they will be able to achieve the power necessary to fulfill these