Science and Technology of Materials, Interfaces, and Processing
Southern California Chapter

Summer 2019 Quarterly Newsletter

Special points of interest:

- Los Angeles Science Fair Winners
- Heated Vacuum Chambers for Surface Treatment and Bake-Out Purposes
- SCCAVS Short Course Program 9/30-10/2/19
- Exhibitor Registration OPEN

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Los Angeles Science Fair Winners 2019

Contributed By Jim Garner

The SCCAVS awarded two prizes to student exhibitors at the Los Angeles Science and Engineering Fair in Pasadena on March 29.

FIRST PRIZE ($200) went to Yeji Cho, a Junior at Palos Verdes Peninsula High School for "Optimization of a Photosynthetic Microbial Fuel Cell."

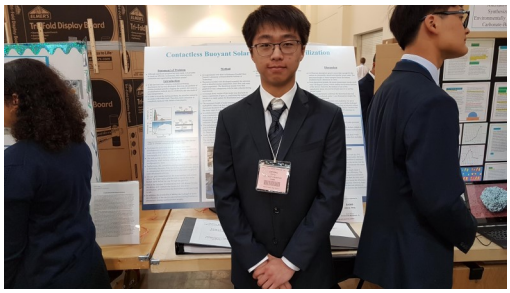
Such fuel cells normally have a reducing, algae cathode and an oxidizing, anaerobic-bacteria anode. A "mediator," such as methyl blue, is used to promote electron transfer from the bacteria to the anode. Ms. Cho hypothesized that riboflavin, used for electron transport in anaerobic respiration, might serve as an effective electron transport mediator for fuel cells as well. Her experiments confirmed that riboflavin significantly outperformed both methyl blue and a mediator-less configuration.

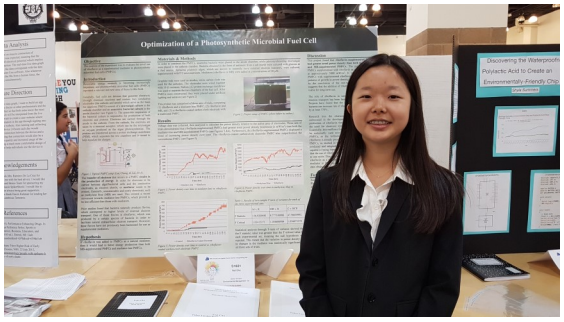
This was the SCCAVS top choice because the project was carried out skillfully and reflected AVS focus on bio-interfaces, catalysts, and surface chemistry. Ms. Cho plans to continue this work in her senior year and then go on to study biochemistry, environmental science, or possibly veterinary medicine in a university.

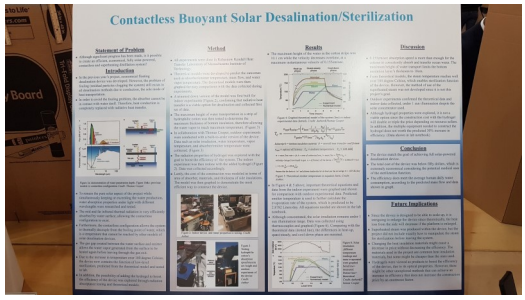
SECOND PRIZE ($100) went to Jiaheng William Wang, Senior at Palos Verdes Peninsula High School for "Contactless Buoyant Solar Desalination/ Sterilization."

Mr. Wang exploits the fact that infrared radiation is entirely absorbed near the surface of water, where it can create a large temperature gradient that is sufficient to support high evaporation rates without heating the entire tank. He has designed a membrane that absorbs solar radiation on one side and re-emits infrared radiation on the other side that optimizes evaporation rate.

We chose this project because the thermodynamics it exploits are widely used in vacuum engineering. Mr. Wang has had two summer internships at MIT and is planning to study mechanical engineering at UC Berkeley or the University of Michigan.







Clockwise from top right: Jiaheng William Wang, Senior at Palos Verdes Peninsula High School, 2nd Prize Poster, Yeji Cho, Junior at Palos Verdes Peninsula High School

You are Invited to Exhibit at the 2019 SCCAVS Exhibition/Short Courses/Student Poster Session!

We are pleased to announce that Exhibitor signups are now being accepted for the 2019 SCCAVS Symposium and Exhibition, which we be held again at the Holiday Inn in Buena Park, on October 1st, 2019.

We are small but mighty and extremely cost-effective! Compare us to those expensive "Big" shows:

Service at Show	SCCAVS	"Big Shows"
Table	$	$$$
Electrical	Free!	$
Drayage	Free!	$
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For More Information Visit:
https://www.sccavs.org/exhibitinfo.htm

SOUTHERN CALIFORNIA CHAPTER OF THE AVS : THE SCIENCE & TECHNOLOGY OF MATERIALS, INTERFACES, AND PROCESSING

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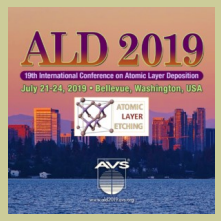
We're on the web!
www.sccavs.org

Upcoming Events

ALD 2019
Hyatt Regency
Bellevue, WA
July 21-24, 2019



SCCAVS Equipment Exhibition & Short Course Program
Holiday Inn
Buena Park, CA
Sept 30-Oct 2, 2019

Special Advertorial Section Sponsored By LACO

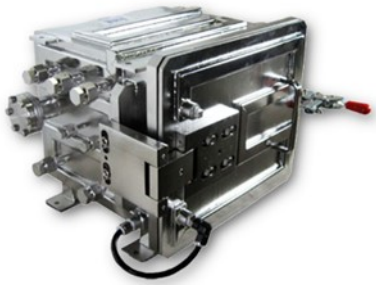
Heated Vacuum Chambers for Surface Treatment and Bake-Out Processes

Many high purity and surface modification processes require vacuum chambers capable of achieving precise temperature conditions. Vacuum chambers capable of heat and high vacuum are an effective way to ensure parts are free from contaminants and volatile materials. For thin-film coating and surface modification processes such as Chemical Vapor Deposition (CVD) and Physical Vapor Deposition (PVD), temperature-controlled vacuum chambers are required. Depending on substrate size and production throughput needs, surface treatments can be achieved with chambers equipped with heating applied via one of three heat transfer methods:

- External heating of chamber walls using electrical elements or fluid jacket which radiates heat from the chamber walls
- Internal infrared (IR) heating element which radiates line-of-site heat from the heating elements
- Heated platen which conducts heat directly to the product in contact with the platen

Heated vacuum chambers support applications such as decorative coatings, semiconductor processes, waterproof coating, optics, roll coating, hard coatings, and solar panels to name a few. Unique process requirements often include options such as positive pressure, multiple feedthroughs, shelving, lighting, and custom viewports. Specialized fixturing can also be utilized for efficient part loading and unloading.

The chamber featured below was developed for chemical vapor deposition (CVD) of medical devices. It features exterior channels on the vacuum chamber for heating fluid providing tight temperature control. The chamber also features shelves to accommodate multiple part testing, electropolished interior and exterior, and a stackable, space-saving design.



LACO TECHNOLOGIES
CREATING VACUUM AND LEAK TESTING SOLUTIONS

(Continued on Page 5)

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CREATING VACUUM AND LEAK TESTING SOLUTIONS

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NPB Technology

Heated Vacuum Chambers (Continued from page 3)

VACUUM BAKE-OUT

Vacuum chambers capable of bake-out (temperatures in excess of 200°C with pumping systems reaching vacuum levels below 10^{-6} Torr) can effectively remove water vapor, cleaning residues, or other contaminants which may have collected on the surface of the part. Many high and ultra-high vacuum applications, as well as high purity applications, require parts free from absorbed volatile materials that may contaminate the system.

To adequately remove water vapor – the most common contaminant – from surfaces, a temperature of approximately 100°C is required under vacuum conditions. Removing water molecules tightly bonded to a pristine surface (for ultra-high purity applications) may require temperatures as high as 600°C. In many cases it is also critical to remove other residues such as hydrocarbons in order to provide acceptable functionality. A common method for determining the cleanliness of the parts being baked out is to use a residual gas analyzer (RGA). The RGA measures the partial pressure of the constituents in the vacuum system and helps determine whether the desired contaminants have been removed or not.

To learn more about Vacuum Coating including thin-film and surface modifications like CVD, PVD and others, visit LACO Technologies at www.lacotech.com/c/vacuum-technology/vacuum-coating-and-treatments. To see examples of heat-controlled vacuum chambers, visit www.lacotech.com/c/vacuum-technology/custom-vacuum-solutions/custom-solutions-thermal-vacuum-systems

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LACO TECHNOLOGIES
CREATING VACUUM AND LEAK TESTING SOLUTIONS

Short Course Program at the SCCAVS Expo September 30-October 2, 2019 |

The SCCAVS will hold its annual Equipment Exhibition, Short Course Program and Poster Session at the Holiday Inn Hotel and Convention Center in Buena Park, CA from September 30 to October 2, 2019. The Equipment Exhibition will be held on Tuesday October 1st and registration is now OPEN for exhibitors at https://www.sccavs.org/exhibitinfo.htm

A FREE WORKSHOP ON HELIUM LEAK DETECTION WILL BE OFFERED FROM 10AM-12PM OCTOBER 1ST PRESENTED BY:

Leybold

The following Short Course Program will be offered and the Registration Form (including links to course descriptions) can be found online at https://www2.avs.org/shortcourses/schedule/sccavs/regform.html

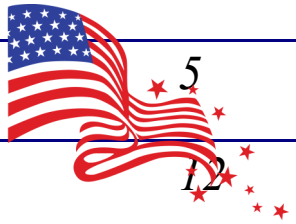
For more information please email info@sccavs.org.

Monday, September 30	***Tuesday, October 1***	***Wednesday, October 2***
Overview of Vacuum Technology (Day 1) ***Tim Gessert***	Overview of Vacuum Technology (Day 2) ***Tim Gessert***	Controlling Contamination in Vacuum Systems ***Tim Gessert***
Introduction to Surface Analysis ***Tom Christenson***	Vacuum and Cryogen Safety ***Roger Schrouf***	Atomic Layer Deposition: Basic Principles, Characterization, and Applications ***Robert Grubbs***
	An Introduction to Ion Sources: Principles & Techniques ***Abe Ghanbari***	Introduction to Spectroscopic Ellipsometry ***Harland Tompkins***

Thank you to our sponsors:

June/July 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
9	10	11	12	13	14	15
16	17 ○ *Full Moon*	18	19	20	21 ☼ *First day of Summer 2019*	22
23	24	25	26	27	28	29
30	1	2 ● *New Moon/ Solar Eclipse*	3	4	5	6
7	8	9	10	11	12	13
14	15	16 *SCCAVS Meeting at Renato's @ 6pm*	17	18	19	20



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