THE VORTEX

AMERICAN CHEMICAL SOCIETY **CALIFORNIA SECTION**
VOLUME LXXIII NUMBER 4 **APRIL 2012**

"The smell of spring" photo from the March 3 talk and tour by Dr.Margareta Sequin

Table of Contents

Robertson Microlit Laboratories

Where speed and accuracy are elemental

Elemental CHN, S, X, Analysis (same day service)
Metals by ICP-OES, ICP-MS, A/A
FTIR, UV/VIS Spectroscopy
Ion Chromatography

Bioavailability
Polarimetry
DSC, TGA, melting point
KF Aquametry, Titrimetry

1705 U.S. Highway 46 • Suite 1D • Ledgewood, NJ 07852 • 973.966.6668 • F 973.966.0136
www.robertson-microlit.com • email: results@robertson-microlit.com

Rapid Results • Quality • Accuracy • Competitive Pricing

STOP WASTING $$$
on vacuum pumps!!

Rebuilding is smart.
A new pump costs **four times** what rebuilding costs.

Rebuilding is easy.
Just call 978 667 2393 for service second-to-none.

Mass-Vac does the job right.
- Factory trained technicians.
- Rebuilt and new pumps in stock.
- No-hassle parts and labor guarantee.
- Complete line of filtration and trap systems.

Because a really old, really healthy vacuum pump is a beautiful thing!

Mass-Vac, Inc.

247 Rangeway Road ▪ PO Box 359 ▪ North Billerica, MA 01862
978 667 2393 Fax 978 671 0014 sales@massvac.com www.massvac.com

THE VORTEX

Published monthly except July & August by the California Section, American Chemical Society. Opinions expressed by the editors or contributors to THE VORTEX do not necessarily reflect the official position of the Section. The publisher reserves the right to reject copy submitted. Subscription included in $13 annual dues payment. Nonmember subscription $15.

MAGAZINE OF THE CALIFORNIA SECTION, AMERICAN CHEMICAL SOCIETY

EDITOR:
Louis A. Rigali
309 4th St. #117, Oakland 94607 510-268 9933

ADVERTISING MANAGER:
Vince Gale, MBO Services
Box 1150 Marshfield MA 02050-1150 781-837-0424

OFFICE ADMINISTRATIVE ASSISTANT:
Julie Mason
2950 Merced St. # 225 San Leandro CA 94577 510-351-9922

PRINTER:
Quantitiy Postcards
255 4th Street #101 Oakland CA 94607 510-268-9933
Printed in USA on recycled paper

CONTRIBUTING EDITORS:
Evaldo Kothny
William Motzer

EDITORIAL STAFF:
Glenn Fuller
Evaldo Kothny
Alex Madonik
Jim Postma

For advertising and subscription information, call the California Section Office, 510 351 9922

California Section Web Site: http://www.calacs.org

Volume LXXIII April 2012 Number 4

Chair's Message

Jim Postma

Most people outside of the ACS probably do not have a strong, positive association with chemistry and environmental issues; in fact they may think of chemists as the source of the problem rather than the solution to earth's environmental problems. But debate about the causes of our current situation should not obscure the fact that chemists are and will continue to be key players in efforts to minimize the environmental effects of human activity as well are remedy effects from the past.

The last ACS meeting in San Francisco had sessions on laboratory waste and green laboratories, and the Division of Environmental Chemistry held talks on water treatment, biofuels, and a host of other earth-friendly topics. One of the big events was a workshop for teachers which demonstrated a host of ideas for celebrating Earth Day with their students.

Earth Day occurs in April each year since its inception in 1970 in San Francisco and is a significant event in the activity calendar of the Section as well as the Society. If you didn't have a chance to submit your K-12 student's entry to the ACS poem contest, "Rethinking Recycling – It's Easy to be Green!" you still have an opportunity to celebrate Earth Day (and John Muir's birthday) with the Section on Saturday, April 21, at the John Muir National Historic site in Martinez. The day (10am-4pm) will be filled with family-oriented demonstrations and activities that focus on the roles that chemists play in developing renewable materials and remediation processes. If you want to volunteer, the contact information for our Earth Day Coordinator, Sushilla Kanodia, can be found at our website, www.calacs.org. Earth Day themes are also important components of the National Chemistry Week activities that Alex Madonik organizes for our section (and continues throughout the year as part of the Family Science Night activities for middle school students.) If you would like to be a volunteer, a participant, or a recruiter of others, Alex would be happy to hear from you. Contact him at madonika@comcast.net.

NDE Analytical
Expert analytical services
- FTIR, FTIR Microscope, FT-Raman
- HPLC/GPC (MS,PDA, RI,RALLS)
- GC/MS, LC/MS (routine and custom)
- UV-Vis, NIR, Fluorescence spectroscopy
- XRF-EDX (Elemental Analysis)
- Contamination, Failure Analysis
- Polymer Characterization

info@ndeanalytical.com Tel: 925-485-0080
www.ndeanalytical.com

Celebrate-Earth Day
JOHN MUIR NATIONAL HISTORIC SITE
4202 Alhambra Ave.
Martinez, CA 94553

"Rethinking Recycling — It's Easy to Be Green!" April 21, 2012

The California ACS Section will again join with other community groups for a combined celebration of Earth Day and John Muir's Birthday on 21st April 2012 on the grounds of the John Muir National Historic Site in Martinez, CA. (10 AM- 4 PM). This celebration will allow interaction with hundreds of families, kids, and adults, at the Cal ACS canopy location. The hands-on demonstrations and activities will be consistent with the ACS Earth Day theme of "Rethinking Recycling — It's Easy to Be Green!" We will show you ways to be environmentally conscious by using renewable materials, and how this relates to chemistry and the roles chemists play. Additional information can be found here. http://portal.acs.org/portal/PublicWebSite/education/outreach/cced/coordinators/index.htm

Volunteers are needed to help with various demonstrations planned for both adults and children that visit. Please check with our Section office for information at office@calacs.org or with Sushila Kanodia (Earth Day Coordinator) at sushila.kanodia@gmail.com

Chico sub-section Meeting Report

California section members who were fortunate enough to tour the Sierra Nevada Brewery were treated not only to a sampling of their renown beers but to tradition, artistry, technology and an enlightening talk about the unique place of beer in our lives by Professor Charlie Bamforth. The brewery was founded in 1979 by Ken Grossman who continues to direct the company that now produces almost a million barrels of beer a year and is soon opening another brewery in North Carolina. The Chico brewery is a work of art. Engraved ceramic tiles including some showing the chemistry of beer adorn the walls. Higher up there are reliefs showing the brewers making beer and on the floor some of the huge stainless steel kettles have been covered with copper to resemble older style brew kettles. Sierra Nevada also uses about a hundred different varieties of hops to flavor their different beers.

Sierra Nevada is a leader in recycling. The spent barley resulting from beer production is fed to cattle that appear later in the brewery's restaurant. The CO^2 is captured and used to push the process through pipes. The northern Sacramento valley where Chico is located can become extremely hot during the summer so the brewery has installed the largest solar panel array of a private company. They provide almost 100% of their own energy. Steam and heat used in the process is also recovered. Electricity for systems requiring energy around the clock are provided by fuel cells. Even the restaurant waste, biodiesel, is used for running the companies vehicles. Waste water is also cleaned and recycled or used in the fields by drip irrigation.

After the tour visitors were treated to about a dozen different beers produced on site, followed by a lunch in the beautiful restaurant at the brewery. The lecture by Professor Bamforth, UC Davis, was held at CSU Chico adjacent to the quaint old downtown shopping area. Professor Bamforth talked about the benefits of beer to humankind as well as its refreshing properties as a beverage. He compared the nutritional properties of beer to wine by explaining that although it is commonly perceived that wine is more healthy than beer, this is a misconception. Wine is usually purchased by people with

(Continued on page 9)

April Section Meeting

Development of Enzymes and Enzyme Systems by Genetic Engineering to Convert Biomass to Sugars

Speaker: Dr. Charles Lee Research Scientist at United States Department of Agriculture-Agriculture Research Services. (USDA-ARS)
Time: Wednesday, April 25, 2012 from 6-7 PM. Reception 5:30-6:00 PM with light refreshments
Cost: $5
Place: USDA-ARS, 800 Buchanan St. Albany, CA 94710
Reservations: office@calacs.org Please RSVP no later than Weds. April 18, 2012. You may prepay by mailing your check to Cal. Section ACS at 2950 Merced St. #225, San Leandro CA 94577. USDA security policies requires you to bring your photo ID with you, to attend. When making your reservations, you will need to provide the following information:

a. Required information for US citizens: affiliation, location, picture ID.
b. Required information for non-US citizens: date of birth, affiliation, location, country of citizenship, picture ID.
c. Citizens of Cuba, Iran, Sudan, Syria cannot be admitted to USDA facilities.

Abstract:

Plant cellulosic material is one of the most viable renewable resources for the world's fuel and chemical feedstock needs. Currently ethanol derived from corn starch is the most common liquid biofuel used in the world. In the United States, more than 95% of fuel ethanol is fermented from storage carbohydrate (corn starch). While 27% of the corn crop is used to produce approximately 13 billion gallons of ethanol, it only displaces 10% of the country's gasoline usage. Thus, it is not possible to replace significantly larger fractions of fossil fuel by relying on grain crops. Great attention, therefore, has been placed on research to harnessing the more abundant structural carbohydrates (lignocelluloses) of plants. The primary disadvantage of lignocellulosic biomass is that these carbohydrates serve a structural and protective function and, thus, have evolved to be resistant to breakdown into simple sugars. This resistance to enzymes is accomplished in part by the crosslinked matrix of the three main components of biomass (cellulose, hemicellulose, and lignin), and each of these fractions is composed of distinct precursors and linkages. This talk will focus on our research to develop the battery of enzymes that will efficiently convert the recalcitrant lignocellulosic biomass into sugars which can be fermented into a wide variety of products.

Biography:

Charles was raised in Mississippi where he earned a B.S. at Millsaps College. He came to UC Berkeley to do his graduate work in DNA transposition in Drosophila melanogaster. Five and a half years of living in a Mediterranean climate convinced him to remain in the Bay Area, and he took a position at the USDA-ARS Western Regional Research Center. For the past 11 years, he has been conducting research on enzymes that hydrolyze different portions of biomass. He has co-authored more than 35 papers, and the reagents he has developed have been

Mysteries of Chinese Purple (Part 2)

Bill Motzer

Egyptian Blue ($CaCuSi_2O_{10}$) is considered to be the first synthetic pigment (see The Vortex, December 2010 and January-February 2011 issues). It was invented and used by the ancient Egyptians in the Mediterranean area, spreading to Mesopotamia and Persia from approximately 3000 BCE until the end of the Roman Empire (~500 CE); with the fall of the Roman Empire its "recipe" was lost until modern times. However, a similar pigment known as Chinese or Han Blue ($BaCuSi_4O_{10}$) and another pigment known as Chinese (Han) Purple ($BaCuSi_2O_6$) appeared in northwestern China from around 800 BCE until the end of the Han Period in 220 CE. Both have been recovered in stained glass artifacts and pigment layers painted on the Terracotta Army. Some scientists believe that the ancient Chinese copied or reverse engineered Chinese Blue from Egyptian Blue. Others doubt this because, although the ancient Egyptians had several thousand years to perfect Egyptian Blue, its manufacturing process was lost prior to the Silk Road that opened China to the west.

Egyptian Blue, Chinese Blue, and Chinese Purple are all alkaline-earth-metal copper silicates and are chemically similar. Egyptian and Chinese Blue even have the same copper and silicate stoichiometry, the same microscopic structure, and crystals of both compounds have the same appearance. But Chinese Purple is very different. Examination of the morphology and phase distribution of pigment clumps from the Terra Cotta warriors indicate that the process by which Chinese Purple was synthesized is very similar to that of barium-containing glasses, and ancient Chinese glass makers may have been attempting to synthesize jade. The process of synthesizing Chinese Purple is now known to have been quite complex, requiring a more precise control of melting temperatures than Egyptian and Chinese Blue pigments. In fact, the ancient Egyptians had problems with such melting temperatures and it appears that in some instances during its synthesis, batches of Egyptian Blue became Egyptian green. However, the ancient Chinese chemists managed to synthesize barium copper silicates in an almost pure form, and they did this before the invention of paper and the magnetic compass. Additionally, although Egyptian Blue occurs as the rare mineral cuprorivaite, $BaCuSi_2O_6$ has never been found in nature as a mineral.

Here's what we now know from modern forensic examinations of Chinese Purple fragments. Barium compounds, either as the minerals barite ($BaSO_4$) or witherite ($BaCO_3$), copper and lead compounds, and quartz (SiO_2) were all used in its preparation. Lead oxide (PbO) was also used as a catalyst in transforming $BaSO_4$ into barium oxide (BaO). At temperatures between 900 and 1,100 °C, the following reaction occurs:

$$BaO + CuO + 2SiO_2 \rightarrow BaCuSi_2O_6$$

Because $BaSO_4$ decomposes at a much higher temperature of 1,560 °C, PbO was used as a catalyst to lower the reaction temperature:

$$PbO + BaSiO_4 \leftrightarrow BaO + PbSO_4$$

An interesting point is that Egyptian Blue forms at temperatures from ~ 800 to 900 ºC; however, Chinese Purple begins forming from 900 to 1,100ºC and Chinese Blue at temperatures exceeding 1,100 ºC. Therefore, by using both barium (as a substitute for calcium) and lead oxide as a catalyst, the ancient Chinese were able to control melting temperature reactions. Barium-containing Chinese glass and Chinese Purple have similar elemental compositions, and as described above, producers of both used lead as a flux to decrease melting temperatures (compared with the sodium and potassium minerals used as fluxes by the ancient Egyptians, which most likely did not control melting temperatures). Recent lead isotope analysis of Chinese Blue and Purple show that both the glass and pigments were manufactured in places that may have occurred very close together and even perhaps in the same workshops. Additionally, more recent detailed studies on the chemical compositions of ancient

(continued on page 8)

April Chemical Anniversaries

Leopold May
The Catholic University of America
Washington, DC

April 1, 1887 One hundred and twenty-five years ago, Bernardo A. Houssay was born. He received the Nobel Prize in Physiology or Medicine in 1947 for his discovery of the part played by the hormone of the anterior pituitary lobe in the metabolism of sugar together with Gerty T. Cori and Carl F. Cori. Their research on the hormone of the anterior lobe and its role in the metabolism of sugar uncovered how glycogen is catalytically converted.

April 6, 1928 Fifty years ago, James D. Watson shared the Nobel Prize in Physiology or Medicine in 1962 with F. H. C. Crick and M. H. F. Wilkins for their discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material. He was born on this date and is a researcher on the double helix structure of the deoxyribonucleic acid (DNA) molecule.

April 14, 1887 The first assembly of the Association des Chimistes Belges (Association of the Belgian Chemists) was held at the La Brasserie Belge in Brussels, on this date.

April 19, 1912 One hundred years ago, Glenn T. Seaborg was born on this date. He codiscovered americium (Am, 95) 1944, berkelium (Bk, 97) 1950, californium (Cf, 98) 1950, curium (Cm, 96) 1944, einsteinium (Es, 99) 1952, fermium (Fm, 100) 1953, mendelevium (Md, 101) 1955, nobelium (No, 102) 1958, plutonium (Pu, 94) 1940, and seaborgium (Sg, 106)) 1974. In 1951, he and Edwin M. McMillan received the Nobel Prize in Chemistry for their discoveries in the chemistry of the transuranium elements.

April 20, 1912 One hundred ago, Gertrude E. Perlmann was born. She did research in protein chemistry and received the Garvan Medal in 1965.

April 20, 1927 Twenty-five years ago, K. Alexander Müller shared the Nobel Prize in Physics with J. Georg Bednorz for their important break-through in the discovery of superconductivity in ceramic materials in 1957. He was born on this date.

April 21, 1889 Seventy-five years ago, Paul Karrer shared the Nobel Prize in Chemistry in 1937 for his investigations on carotenoids, flavins and vitamins A and B2 with Walter N. Haworth for his investigations on carbohydrates and vitamin C. He synthesized vitamins A, 1931, B2 (riboflavin), 1935, and E (tocopherol), 1938. He was born on this date.

April 22, 1919 Twenty-five years ago, Donald J. Cram shared the Nobel Prize in Chemistry with C. J. Pedersen and J-M. P. Lehn for their development and use of molecules with structure-specific interactions of high selectivity. He did research in the application of stereochemical techniques to organic reaction mechanism, invented carceplexes or guest molecules completely encapsulated by the host, synthesized a variety of host-guest complexes including crown ether complexes and was born on this date.

April 28, 1937 Seventy-five years ago, Champion International was incorporated on this date.

Additional historical events can be found at Dr. May's website, HYPERLINK "http://faculty.cua.edu/may/Chemistrycalendar.htm" http://faculty.cua.edu/may/Chemistrycalendar.htm

California Section
Women Chemists Committee April Meeting

Direct Hierarchical Assemblies Using Secondary Interactions

Speaker: Dr. Ting Xu, Assistant Professor of Chemistry, UCB, LBNL Faculty Scientist)
Time: Saturday, April 28, 2012
11:00 am — Meet the speaker
12:00 pm — Lunch
1:00 pm — Presentation
Cost: $15.00 Lunch (Students and Unemployed Chemists $7.50) Presentation is free
Place: 775 Tan Hall, UC Berkeley Campus
Reservations: RSVP no later than Friday, April 20, 2012 to the California Section office at office@calacs.org or call (510) 351-9922. If mailing a check in advance, please make payable to "California Section ACS" and send to Cal Section Office, 2950 Merced Street #225, San Leandro, CA 94577, postmarked no later than April 20, 2012

Abstract

Molecular building blocks can be readily synthesized with great potential to impact human health, renewable energy and the environment. However, generating hierarchically structured materials similar to nature represents a fundamental scientific challenge.

Focus will include advances in directed self-assemblies over multiple length scales in multi-component systems, opportunities in these studies and field challenges in the advancement of nano-materials.

(Continued from page 6)

Chinese pigments have shown that in the phase diagrams of the barium-copper silicate system, at least four stoichiometric ternary phases exist, each having a different color:

$Ba_2CuSi_2O_7$: light blue
$BaCuSi_4O_{10}$: blue
$BaCuSi_2O_6$: purple
BaCu2Si_2O_7: blue

The same does not occur with Egyptian Blue. However, synthesis of pure solid phases by the ancient Chinese probably did not occur because such synthesis depends on several factors such as the raw material's relative purity, their mixing ratios, the addition of fluxes that influenced subsequent melting temperatures (which also may have been influenced by the surrounding atmosphere), and reaction times. Therefore, although modern phase diagrams suggest that different unique products could be obtained, quite often a mixture of these compounds occurred, because simultaneous control of the described conditions could not be achieved.

Although we have descriptions of Egyptian Blue's manufacture from Roman writings (see December 2010 Vortex) no written records for its preparation has been found. The same is true for Chinese Blue and Chinese Purple and the recipes for making these pigments is inferred from modern forensic investigations, which have determined that the process is rather complicated even for today's skilled chemists. However, it is quite conceivable that ancient Chinese craftsmen experimented with and developed sophisticated chemical procedures requiring complicated methods employing very high degrees of technical skill. This would make them the first experimental chemists. But even more mysteries surround Chinese Purple and we will explore those next time.

(continued from page 4)

higher incomes, and in fact, a recent survey of shoppers leaving a supermarket found that wine purchasers also bought tofu, lettuce, orange juice, yogurt and other healthy foods. Beer purchasers on the other hand had chips, cheese, cigarettes, candies and other less healthy foods in their baskets. In conclusion, beer is the only thing keeping the latter alive according to Dr. Bamforth.

Please check the website, www.calacs.org for information on up coming Science Cafes and Section events and activities.

vacuubrand

Five Decades of Vacuum Innovation

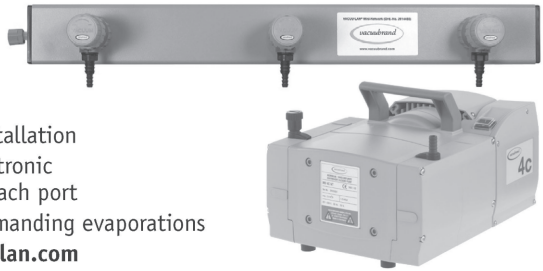
Instant Vacuum Capacity

The VACUU•LAN® Mini-Network

- One pump serves 3 – 6 users
- Cross-talk protection
- No construction/installation
- Upgradeable to electronic vacuum control at each port

Simple filtration to demanding evaporations

Details at **www.vacuu-lan.com**

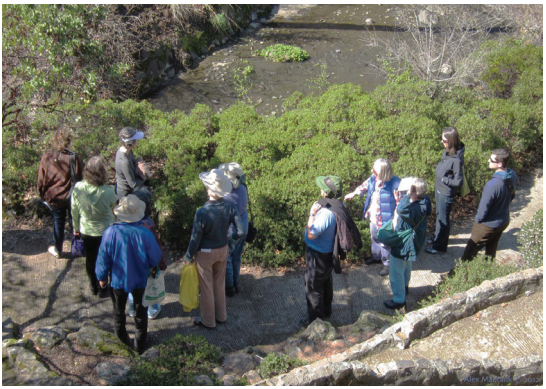


VACUUBRAND, INC.
888-882-6730

www.vacuubrand.com
info@vacuubrand.net

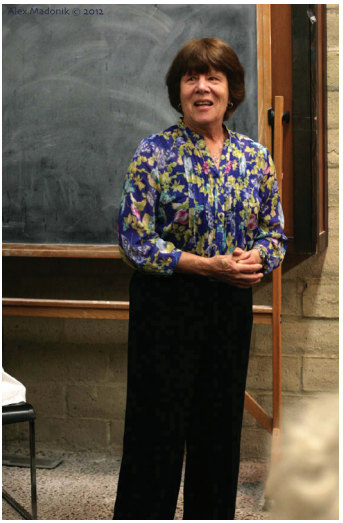
Science Educators - Win a BUBBLE Grant!

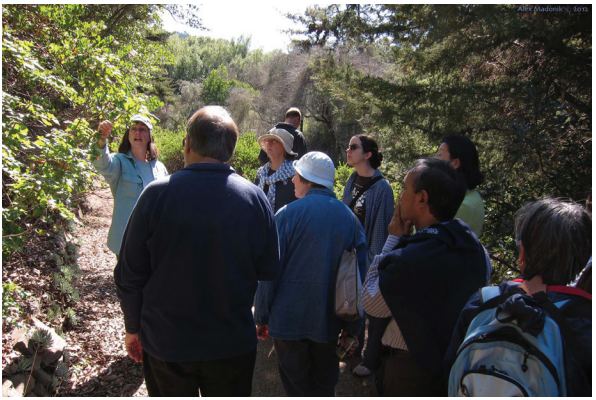
The Santa Clara Valley Section of the American Chemical Society is pleased to announce a call for proposals from K-12 science teachers to apply for a BUBBLE grant of up to $500 for worthwhile science projects. Grants will be awarded for projects that enhance the teaching of physical, life or earth science. The grant may not be used for teacher awards or
compensation. Qualified uses of the funds are for purchases related to the proposed project such as scientific equipment, instructional materials and/or supplies.
The 2012 grant program is now open for applications. The deadline for submission of all proposals is August 15, 2012. The winners will be announced and contacted by e-mail after September 1, 2012. For submittal information please email BUBBLE_Grant@scvacs.org.



Tour with Docent Susan Agnew

Photos of the WCC March 3, 2012 tour and talk “The Chemistry of Plants: Perfumes, Pigments, and Poisons A discussion” by Professor Emerita Margareta Sequin San Francisco State University,past co-chair of the Womens Chemists Committee





Tour with Docent Marci Kolb

BUSINESS DIRECTORY

RECRUITING
WEB SITE LISTING
DIRECT TO YOUR SITE

There are two important ways to recruit through our services. One is to place a print ad in the Vortex. The other is to place a web site ad reaching out to 40,000 ACS members. We recommend using both low cost methods.

You can view both of these opportunities by going to the link below.

Who uses these options?

- Companies for lab, management and sales personnel
- University & College teaching positions
- Hospitals for technical and research personnel

We can provide more qualified resumes because of the highly targeted technical audience.

info -- www.mboservices.net

ELEMENTAL ANALYSIS

◆C,H,N,O,S,P ◆Halogens
◆Ash ◆Metals ◆TOC ◆TOX
◆BTU ◆ICP ◆ICP/MS ◆IC

Custom Analysis ♦ Problem Solving

HUFFMAN
Laboratories, Inc
Quality Analytical Services Since 1936

4630 Indiana Street Golden, CO 80403
Fon:303-278-4455 Fax: 303-278-7012
Chemistry@huffmanlabs.com
www.huffmanlabs.com

NMR Service 500MHz

*Mass
*Elemental Analysis

NuMega Resonance Labs
numegalabs.com P- 858-793-6057

NMR Sample Tubes

Sampling Supplies / Accessories
Quality and Value
See our full catalog/pricing at
www.newera-spectro.com
CAGE Code: 44ME9 DUNS: 556785657

New Era Enterpriese, Inc.
1-800-821-4667
cs@newera-spectro.com

DELSEN Testing Laboratories, Inc.
SPECIALISTS IN TESTING ADVANCED COMPOSITES

- Mechanical Testing
- Thermal Analysis
- Thermal Cycling
- Electrical Properties
- Metallography
- Flammability, Smoke Toxicity and OSU Heat Release

1024 Grand Central Avenue • Glendale, CA 91201
Internet: www.delsen.com • Fax: (818) 247-4537
888-433-5736
MEMBER ACIL

INDEX OF ADVERTISERS

Recruitment

TELL OUR ADVERTISERS

Advertisers want to know if their ads are working. When you call or write them, tell them you saw their ad in The Vortex. This will allow us to increase the amount of articles that you have asked for.

Bay Bioanalytical Laboratory, Inc.

A Contract Analytical Lab Serving the Pharmaceutical Industry since 1991

HPLC Methods Development & Validation
GC/MS UV-Vis Polarimetry Karl Fischer

LC/MS/MS Support for Drug Discovery & Development

- State-of-the-art equipment
- Fast turn-around times

Services Include:

- Quantitation
- MW Determination
- Structural Elucidation (unknowns & impurities)
- Proteomics

BBL is cGMP/GLP compliant & FDA inspected
551A Linus Pauling Dr. Hercules CA 94547
phone: 510-724-8052 fax: 510-724-8053
chemists@baybiolab.com
www.baybiolab.com

Non-Profit Organization
U.S. POSTAGE
PAID

TIME VALUE

CALIFORNIA SECTION
AMERICAN CHEMICAL SOCIETY
2950 Merced St #225 San Leandro CA 94577

PLEASE DO NOT DELAY - DATED NOTICE INSIDE