ASHRAE Bi-State Chapter

Exchanger

Volume XXVIII, Issue 5 | Serving the Hudson Valley and Western Connecticut | January 2015

Inside this Issue

Save the Date

1 PDH Credit

Chapter Meeting
January 14th

Meeting Location: Casa Rina
886 Commerce Street
Thornwood NY 10592

5:30 - 6:00PM Arrival and Networking
6:00 - 7:30PM Buffet Dinner
7:30 - 8:30PM Main Presentation

$25 Members, $30 Non-Members
Complimentary Admission for Engineering Students

Walk-ins and General Public Welcomed

How to Reduce OA (Energy) and Maintenance While Providing Exceptional IAQ Using ASHRAE 62 IAQP (PDH Available)

The presentation will cover how energy can be saved by ventilation air reduction based on ASHRAE 62 IAQ Procedure by utilizing cold plasma air cleaning technology, all while remaining code compliant. The reduction in maintenance (old cooling coils become clean and new coils remain clean) due to the cold plasma will be covered. In addition, the health benefits by the reduction of VOC's, particles, pathogens and mold spores will be covered plus a case study on a recent college in Florida that used cold plasma technology to reduce outside air while providing exceptional IAQ will be discussed.

Presented by Charles Waddell. Mr. Waddell is the president of Global Plasma Solutions, a Savannah, GA based air purification-company with satellite offices in Roanoke, VA and Abu Dhabi, that specializes in education and healthcare air quality and energy saving solutions using cold plasma technology. Mr. Waddell's experience includes designing mechanical, electrical, refrigeration and control systems in the commercial and industrial HVAC markets as well as assisting engineering firms in the design of over 400 K-12 schools throughout North America. . Mr. Waddell has over 14 years of HVAC design experience and over 11 years of sales and management experience. He has presented at over 35 different ASHRAE meetings in the last 5 years. Mr. Waddell's latest accomplishments include receiving four patents and having an article published in Engineered Systems Magazine on Desiccant Dehumidification.

President's Message

By James F. Dolan, P.E.

Happy New Year to our Bi-State members! We had a festive Holiday meeting in December with our guest speaker JCI's Joe Klotz at Lucy's in Pleasantville. Joe gave us tremendous insight into controls and where the controls industry is going. Thank you Joe for your time and for sharing your expertise!

We also had an enthusiastic showing for our drive for "Toys for Tots" and the night sponsored by the Chapter and JCI enabled us to focus on doing something for Children this Holiday Season. In addition we had a winner for the Bad Holiday Sweater Contest – Well Done Stephanie! Thank you again to Johnson Controls and their staff for helping to make this a great event and one that I would anticipate our Chapter emulating for years to come.

Upcoming January Meeting on Wednesday January 14th

See our notice in this Exchanger for the upcoming January meeting where Charles Waddell who is an expert on air purification shall discuss ASHRAE 62 and ways to approach the ventilation and other IAQ requirements. The event will be back our usual venue of Casa Rina in Thornwood. There will be a PDH so it should help those looking for professional development hours going into the New Year.

January also is the winter meeting for ASHRAE in Chicago, Illinois. The EXPO is also during that time the week of the 26th of January.

Looking forward for our Chapter, we plan to have a tour of the Belimo Plant in February (also will have a PDH for a presentation on maintaining proper delta T for hydronic systems) and our golf date has been set so see that "Save the Date" in this issue as well. We anticipate a great turnout at the Links, so get your golf group in early and shore up your sponsorships. See you on the 14th at Casa Rina!

Jim

Compact Batteries Enhanced By Spontaneous Silver Matrix Formations

In a promising lithium-based battery, the formation of a highly conductive silver matrix transforms a material otherwise plagued by low conductivity. To optimize these multi-metallic batteries--and enhance the flow of electricity--scientists needed a way to see where, when, and how these silver, nanoscale "bridges" emerge. Now, researchers from the U.S. Department of Energy's Brookhaven National Laboratory and Stony Brook University have used x-rays to map this changing atomic architecture and revealed its link to the battery's rate of discharge. The study - published online in the journal *Science* - shows that a slow discharge rate early in the battery's life creates a more uniform and expansive conductive network, suggesting new design approaches and optimization techniques. "Armed with this insight into battery cathode discharge processes, we can target new materials designed to address critical battery issues associated with power and efficiency," said study coauthor Esther Takeuchi, a SUNY Distinguished Professor at Stony Brook University and Chief Scientist in Brookhaven Lab's Basic Energy Sciences Directorate.

The scientists used bright x-ray beams at Brookhaven Lab's National Synchrotron Light Source (NSLS) - a DOE Office of Science user facility - to probe lithium batteries with silver vanadium diphosphate (Ag2VP2O8) electrodes. This promising cathode material, which may be useful in implantable medical devices, exhibits the high stability, high voltage, and spontaneous matrix formation central to the research. "The experimental work - in particular the in-situ x-ray diffraction in batteries totally encased in stainless steel - should prove useful for industry as it can penetrate prototype and production-level batteries to track their structural evolution during operation," Takeuchi said.

In most batteries, the speed of lithium-ion diffusion determines the rate of discharge, a key factor in overall performance and efficiency. The material closest to the lithium anode would ordinarily discharge first, as the ions have a shorter distance to travel. In a surprising discovery, the researchers found that the material farthest from the anode and nearest the coin cell surface discharged first in the battery. "This is because the non-discharged cathode material is a very poor electric conductor, so the resistance for lithium ion diffusion is less than for electron flow," said coauthor and SUNY Distinguished Teaching Professor Kenneth Takeuchi. "This highlights a uniquely efficient aspect of in situ silver matrix formation: The silver matrix forms primarily where needed, which is more efficient than using conductive additives."

NSLS ended its 32-year experimental run in September 2014, but its powerful successor is already taking data at Brookhaven Lab. The National Synchrotron Light Source II (NSLS-II) provides beams 10,000 times brighter than NSLS, and in situ energy research is a major part of its mission. NSLS-II, also a DOE Office of Science User Facility, will soon welcome users from industry, academia, and other national labs. "We are currently working on other materials that form conductive networks and hope to study them as functioning cells," Takeuchi said. "The brighter beams and greater spatial resolution of NSLS-II will be a great tool in studying other cathodes and pushing this technology forward."

2015 Annual Golf Outing

Save the Date

May 13, 2015

for the ASHRAE
Bi-State Chapter
Annual Golf Outing
hosted at

The Links at Union Vale

the links at union vale

ASHRAE Bi-State Chapter

Shaping Tomorrow's Built Environment Today

ASHRAE Research

ASHRAE's Research Program sets ASHRAE apart from other professional societies and associations of its kind. ASHRAE's Handbook series, technical programs, standards, and special publications all utilize the results of Research conducted through ASHRAE funding. ASHRAE conducts timely research to remain the foremost, authoritative and responsive international source on the interaction between people and the indoor and outdoor environment through the operation of HVAC&R systems in buildings and other applications.

Research Donations in particular are the foundation of the ASHRAE Research Program. We at the Bi-State Chapter of ASHRAE would like to invite you to invest in ASHRAE Research. ASHRAE is a not-for-profit organization and needs your support for continued success! The Bi-State Chapter of ASHRAE has continued to raise the bar for research funding, and we couldn't have done it without your help. We would like to thank last year's contributors shown below.

We hope that we can count on you to help us reach our goal of $6,250 for the 2014 – 2015 campain year. You can do this by filling in the form below or by contributing on-line at: https://xp20.ashrae.org/secure/researchpromotion/rp.html.

For further information or assistance contact Cliff Konitz, RP Chair, at 845-297-5864 or mailto:c.konitz@verizon.net

Shaping Tomorrow's Built Environment Today

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- Special ASHRAE publications
- Articles published in the ASHRAE Journal

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- Contributions from members and corporations
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- Income from the ASHRAE cosponsored AHR Expo
- Interest earned on the Research Reserve and ASHRAE Foundation

HOW IS MONEY RAISED?

- Personal contact made by volunteers
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HOW DOES ASHRAE RESEARCH HELP ME?

- Decreasing the spread of airborne diseases
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PLEASE COMPLETE THE INFORMATION BELOW AND RETURN WITH YOUR CONTRIBUTION TO:

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Donors are recognized for their contributions as follows:

Honor Roll contributors are listed in the October ASRHAE Journal and receive the commemorative coin recognizing Giants in HVAC&R invention or innovation.

Individual Honor Roll beginning at $100
Corporate Honor Roll beginning at $150

Investors with contributions of $250 or more receive a wall plaque that can display six commemorative coins.

Contributions in any amount are gratefully received and 100% of the contribution goes directly to research. All contributions are tax deductible.

ICC Approves Outcome Based Compliance Path for IgCC

The International Code Council has approved an optional outcome-based pathway for use with the 2015 version of the International Green Construction Code (IgCC) to comply with local building energy codes. This is the first time that the provision—which allows project teams to quantify a building's performance through energy consumed once it is occupied and regularly maintained—has been offered for the national code. The outcome-based option joins the current accepted model-based performance and code-defined prescriptive measures. It is intended to give design teams the ability to achieve compliance through actual performance and operations.

ASHRAE Certification Programs

BEMP Practice Exam Now Available

ASHRAE has launched a practice exam for the Building Energy Modeling Professional (BEMP) certification. The practice exam is designed to be similar in content and difficulty to the actual certification exam. It is a low-cost, online tool for limited self-assessment with a score report overview of performance at the end of the exam. Practice exams are already in place for the BEAP, CPMP and HFDP certifications. Practice exams for the HBDP and OPMP certifications are under development and should be launched later this year.

Visit www.ashrae.org/BEMP to learn more about the BEMP practice exam.

Visit www.ashrae.org/certification to learn more about ASHRAE certifications.

New Publications from ASHRAE

ASHRAE, a leader in building information technology, develops publications that impact every facet of the environment, both indoors and out.

Data Center Design and Operation – ASHRAE Datacom Series CD 4th Ed.

This CD-ROM presents the full text of all eleven ASHRAE Datacom Series publications and Standard 127-2012 in fully searchable and printable PDF format. Authored by ASHRAE Technical Committee 9.9, the Datacom Series provides comprehensive treatment of data center cooling, energy efficiency, and related subjects.

$289 ($246 ASHRAE Member) / CD / 2014

ASHRAE Reference Offers Design Guidance on Healthcare HVAC Systems

The second edition of *HVAC Design Manual for Hospitals and Clinics* provides in-depth design recommendations based on best practices from consulting and hospital engineers, with a focus on presenting what's different about healthcare HVAC systems.

$129 ($109 ASHRAE Member) / 312 pages / 2013

Visit www.ashrae.org/bookstore to learn more about these and other outstanding ASHRAE publications!

Oregon Researchers Glimpse Pathway of Sunlight to Electricity

Four pulses of laser light on nanoparticle photocells in a University of Oregon spectroscopy experiment has opened a window on how captured sunlight can be converted into electricity. The work, which potentially could inspire devices with improved efficiency in solar energy conversion, was performed on photocells that used lead-sulfide quantum dots as photoactive semiconductor material. The research is detailed in a paper placed online by the journal *Nature Communications*.

In the process studied, each single photon, or particle of sunlight, that is absorbed potentially creates multiple packets of energy called excitons. These packets can subsequently generate multiple free electrons that generate electricity in a process known as multiple exciton generation (MEG). In most solar cells, each absorbed photon creates just one potential free electron. Multiple exciton generation is of interests because it can lead to solar cells that generate more electrical current and make them more efficient. The UO work shines new light on the little understood process of MEG in nanomaterials.

While the potential importance of MEG in solar energy conversion is under debate by scientists, the UO spectroscopy experiment -- adapted in a collaboration with scientists at Sweden's Lund University -- should be useful for studying many other processes in photovoltaic nanomaterials, said Andrew H. Marcus, professor of physical chemistry and head of the UO Department of Chemistry and Biochemistry.

Spectroscopic experiments previously designed by Marcus to perform two-dimensional fluorescence spectroscopy of biological molecules were adapted to also measure photocurrent. According to Professor Marcus, an affiliate in UO's Institute of Molecular Biology, Materials Science Institute and Oregon Center for Optics, "Spectroscopy is all about light and molecules and what they do together. It is a really great probe that helps to tell us about the reaction pathway that connects the beginning of a chemical or physical process to its end. The approach is similar to looking at how molecules come together in DNA, but instead we looked at interactions within semiconductor materials. Our method made it possible to look at electronic pathways involved in creating multiple excitons. The existence of this phenomenon had only been inferred through indirect evidence. We believe we have seen the initial steps that lead to MEG-mediated photo conductivity."

The controlled sequencing of laser pulses allowed the seven-member research team to see -- in femtoseconds (a femtosecond is one millionth of one billionth of a second) -- the arrival of light, its interaction with resting electrons and the subsequent conversion into multiple excitons. The combined use of photocurrent and fluorescence two-dimensional spectroscopy, Marcus said, provided complementary information about the reaction pathway.

UO co-author Mark C. Lonergan, professor of physical and materials chemistry, who studies electrical and electrochemical phenomena in solid-state systems, likened the processes being observed to people moving through a corn maze that has one entrance and three exits. People entering the maze are photons. Those who exit quickly represent absorbed photons that generate unusable heat. People leaving the second exit represent other absorbed photons that generate fluorescence but not usable free electrons. People leaving the final exit signify usable electrical current.

"The question we are interested in is exactly what does the maze look like," Lonergan said. "The problem is we don't have good techniques to look inside the maze to discover the possible pathways through it. The techniques that Andy has developed basically allow us to see into the maze by encoding what is coming out of the system in terms of exactly what is going in. We can visualize what is going on, whether two people coming into the maze shook hands at some point and details about the pathway that led them to come out the electricity exit."

New Law for Superconductors

MIT researchers have discovered a new mathematical relationship — between material thickness, temperature, and electrical resistance — that appears to hold in all superconductors. They describe their findings in the latest issue of *Physical Review B*. The result could shed light on the nature of superconductivity and could also lead to better-engineered superconducting circuits for applications like quantum computing and ultralow-power computing.

"We were able to use this knowledge to make larger-area devices, which were not really possible to do previously, and the yield of the devices increased significantly," says Yachin Ivry, a postdoc in MIT's Research Laboratory of Electronics, and the first author on the paper. Ivry works in the Quantum Nanostructures and Nanofabrication Group, which is led by Karl Berggren, a professor of electrical engineering and one of Ivry's co-authors on the paper. Among other things, the group studies thin films of superconductors.

Superconductors are materials that, at temperatures near absolute zero, exhibit no electrical resistance; this means that it takes very little energy to induce an electrical current in them. A single photon will do the trick, which is why they're useful as quantum photodetectors. And a computer chip built from superconducting circuits would, in principle, consume about one-hundredth as much energy as a conventional chip.

"Thin films are interesting scientifically because they allow you to get closer to what we call the superconducting-to-insulating transition," Ivry says. "Superconductivity is a phenomenon that relies on the collective behavior of the electrons. So if you go to smaller and smaller dimensions, you get to the onset of the collective behavior."

Specifically, Ivry studied niobium nitride, a material favored by researchers because, in its bulk form, it has a relatively high "critical temperature" — the temperature at which it switches from an ordinary metal to a superconductor. But like most superconductors, it has a lower critical temperature when it's deposited in the thin films on which nanodevices rely. Previous theoretical work had characterized niobium nitride's critical temperature as a function of either the thickness of the film or its measured resistivity at room temperature. But neither theory seemed to explain the results Ivry was getting. "We saw large scatter and no clear trend," he says. "It made no sense, because we grew them in the lab under the same conditions."

So the researchers conducted a series of experiments in which they held constant either thickness or "sheet resistance," the material's resistance per unit area, while varying the other parameter; they then measured the ensuing changes in critical temperature. A clear pattern emerged: Thickness times critical temperature equaled a constant — call it A — divided by sheet resistance raised to a particular power — call it B. After deriving that formula, Ivry checked it against other results reported in the superconductor literature. His initial excitement evaporated, however, with the first outside paper he consulted. Though most of the results it reported fit his formula perfectly, two of them were dramatically awry. Then a colleague who was familiar with the paper pointed out that its authors had acknowledged in a footnote that those two measurements might reflect experimental error: When building their test device, the researchers had forgotten to turn on one of the gases they used to deposit their films.

The other niobium nitride papers Ivry consulted bore out his predictions, so he began to expand to other superconductors. Each new material he investigated required him to adjust the formula's constants — A and B. But the general form of the equation held across results reported for roughly three dozen different superconductors. It wasn't necessarily surprising that each superconductor should have its own associated constant, but Ivry and Berggren weren't happy that their equation required two of them. When Ivry graphed A against B for all the materials he'd investigated, however, the results fell on a straight line.

Finding a direct relationship between the constants allowed him to rely on only one of them in the general form of his equation. But perhaps more interestingly, the materials at either end of the line had distinct physical properties. Those at the top had highly disordered — or, technically, "amorphous" — crystalline structures; those at the bottom were more orderly, or "granular." So Ivry's initial attempt to banish an inelegance in his equation may already provide some insight into the physics of superconductors at small scales.

"None of the admitted theory up to now explains with such a broad class of materials the relation of critical temperature with sheet resistance and thickness," says Claude Chapelier, a superconductivity researcher at France's Alternative Energies and Atomic Energy Commission. "There are several models that do not predict the same things." Chapelier says he would like to see a theoretical explanation for that relationship. But in the meantime, "this is very convenient for technical applications," he says, "because there is a lot of spreading of the results, and nobody knows whether they will get good films for superconducting devices. By putting a material into this law, you know already whether it's a good superconducting film or not."

Energy Department Releases Energy Sector Cybersecurity Framework

Energy companies and utilities should develop risk management strategies and incorporate cyber best practices into their security procedures, according to voluntary guidance released by the Energy Department recently.

The Energy Sector Cybersecurity Framework Implementation Guidance was developed in response to the overall Cybersecurity Framework released by the National Institutes of Standards and Technology in early 2014 and to an earlier executive order calling for cybersecurity collaboration between industry and government.

The guidance offers tips and best practices to energy companies and helps chart out how private sector companies can develop a comprehensive cybersecurity framework.

Some of the steps include:

- Developing a risk management strategy to identify and evaluate areas of improvement within the organization.
- Orienting assets and resources toward risky areas and to improve cybersecurity methodology and management standards.
- Determining where gaps exist and prioritizing the gaps based on the potential consequences of a cyber intrusion.

The American Gas Association said in a statement that it welcomed the release of the guidance and that the organization worked closely with the Energy Department to develop the steps and procedures.

"This productive collaboration has ensured that the final guidance meets the needs of AGA and its member companies and will help enhance the security of the natural gas industry, its customers and the nation" the AGA said.

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Why Be Involved in a Local Chapter?

- Learn about the latest technologies presented in the program sessions
- Attain continuing education credits
- Meet industry associates and discuss local concerns
- Network amongst designers, installers, vendors, educators, in your local area to help improve business for all
- Share experiences with others
- Enjoy a social hour
- Carry out ASHRAE's mission on a local level

To advance the arts and sciences of heating, ventilating, air conditioning and refrigerating to serve humanity and promote a sustainable world.

Notice to business card advertisers:

We are currently accepting business card advertisements for this year's newsletters. The cost of a business card ad is $125.00. The newsletter is published monthly, September through June (ten issues). That means for $125.00 ($12.50 an issue), your business card ad will circulate to approximately 300 recipients a month or an advertising cost of approximately 4 cents/recipient.

If you are interested in placing an ad, please forward a business card and check (payable to ASHRAE Bi-State) to:

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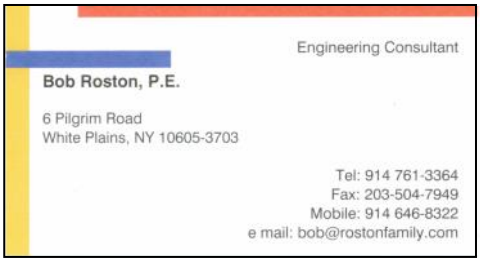

Employment Opportunities

Employment ads may be submitted for inclusion in **The Exchanger** as follows:

1.$100.000 from companies placing ad for one (1) month.

2.$150.00 from companies placing ad for two (2) months.

3.No charge for members looking for employment.

DOE Issues New Efficiency Rules for Fluorescent Lamps, Commercial Ice Makers

The U.S. Department of Energy (DOE) completed new standards for general service fluorescent lamps (GSFLs) and automatic commercial ice makers (ACIMs). Typically used for indoor lighting in homes, commercial establishments such as restaurants, and in industrial factories, GSFLs are used on average for approximately 630 hours per household, 4,000 hours per commercial establishment, and 4,500 hours per establishment in the industrial sector each year. DOE estimates that the new efficiency rules will save consumers more than $15 billion in electricity bills through 2030. DOE says that the new standard for automatic commercial ice makers will help reduce harmful carbon dioxide pollution by 4 million metric tons and save consumers nearly $600 million in electricity bills through 2030.

ASHRAE, founded in 1894, is a building technology society with more than 50,000 members worldwide. The Society and its members focus on building systems, energy efficiency, indoor air quality and sustainability within the industry. Through research, standards writing, publishing and continuing education, ASHRAE shapes tomorrow's built environment today.

ASHRAE will be the global leader, the foremost source of technical and educational information, and the primary provider of opportunity for professional growth in the arts and sciences of heating, ventilating, air conditioning and refrigerating.

Upcoming Meetings

Month	Date	Promotion	Main Presentation	Tech Session
February	2/11/2015	Research Promotion	Belimo plant tour	
March	3/11/2015	Student Activities	Save the date	
April	4/8/2015	Sustainability	Technical program at sustainable demonstration location	Earth Day
May	5/13/2015	Student Scholarships	Golf Outing	
June	6/10/2015	Membership Promotion	Save the date	

Researchers Develop Heat-Conducting Plastic

Researchers at the University of Michigan have developed a type of plastic they say is ten times better at conducting heat than conventional counterparts and may lead to making more powerful electronics or more efficient vehicles. The new material, which is actually a blend, results from one of the first attempts to engineer the flow of heat in an amorphous polymer, a large molecule made of smaller repeating molecules. Lead researcher Jinsang Kim, an associate professor of materials science and engineering, says previous efforts to boost heat transfer in polymers have relied on metal or ceramic filler materials, or stretching molecule chains into straight lines. "Those approaches can be difficult to scale up and can increase a material's weight and cost, make it more opaque, and affect how it conducts electricity and reflects light," he said. He adds that the new material has none of those drawbacks and is easy to manufacture with conventional methods. The study is published in the journal *Nature Materials*.

Low-Grade Waste Heat Regenerates Ammonia Battery

An efficient method to harvest low-grade waste heat as electricity may be possible using reversible ammonia batteries, say Penn State engineers. "The use of waste heat for power production would allow additional electricity generation without any added consumption of fossil fuels," said Bruce E. Logan, the lead researcher. Low-grade waste heat is an artifact of many energy-generating methods. Power plants, geothermal sources, and solar power plants require high heat to produce electricity. However, the excess waste heat is routed to cooling towers or otherwise dissipated. The researchers are using a thermally regenerated ammonia-based battery that consists of copper electrodes with ammonia added only to the anolyte, the electrolyte surrounding the anode. This type of battery would be useless as a constant source of electricity if the reaction were not regenerative. Using low-grade waste heat from an outside source, the researchers distill ammonia from the effluent left in the battery anolyte and then recharge it into the original cathode chamber of the battery.

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