

**American Institute of Chemical Engineers,
Cleveland Section**

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ASM Joint Meeting: Monday, October 30, 2023, 5:30 PM

AICHE Membership Not Required to attend any meetings

<https://www.fivesgroup.com/energy-combustion>

Heat Treater's Night 2023

"The future of gas combustion – Hydrogen and its effect on the heating of metals"

By: Justin Dzik, P.E. Director, Innovation & Business Development

At: FIVES North American Combustion, Inc. 4455 E. 71st Street Cleveland, OH 44105

ABSTRACT: As the world looks to decarbonize, industrial processes will have to meet the challenges. One possible outcome for industrial decarbonization is changing to hydrogen as a fuel source from traditional carbon-based fuels. However, pure hydrogen as an industrial fuel source in the metals industry is largely unknown, specifically from its metallurgical impacts and its heating characteristics. The use of hydrogen is hypothesized to have different metallurgical impacts depending on the material. This is of specific interest to materials such as titanium or aluminum which have an affinity for hydrogen. Also, the heating characteristics of hydrogen combustion for each metal is of interest and specifically the focus of the study presented.

BIOGRAPHY: Justin Dzik, PE has broad responsibilities in leading and supporting the global Sales Group of Fives North American Combustion within the major thrust markets of our strength. I am responsible for leading the development of an Innovation Road Map setting up the Company for a future stream of new products. I also bring leadership skills to the Business Development and Innovation Groups to develop team members to achieve their full potential while growing the business through improving our flagship products, services and competitiveness within our major markets. I also identify innovation capital projects, provide business case for these projects, and execute these projects in alignment with Company Ambitions. Prior to his director position, Mr. Dzik served as Manager of Business Development, Manager of Systems Solutions Steel/Forging, Steel Forging Technical Lead, and Combustion Engineer at FIVES North American Combustion, Inc.

For those attending this event, a Professional Development Hour Certificate (1 PDH) will be sent to you from ASM. Please inform ASM of your interest in receiving a PDH Certificate for this meeting by requesting a PDH certificate during Registration below in the comments section.

Meeting Location:

4455 E. 71st Street
Cleveland, OH 44105

FIVES North American Combustion, Inc. (see map below)

5:30 PM – Social Gathering

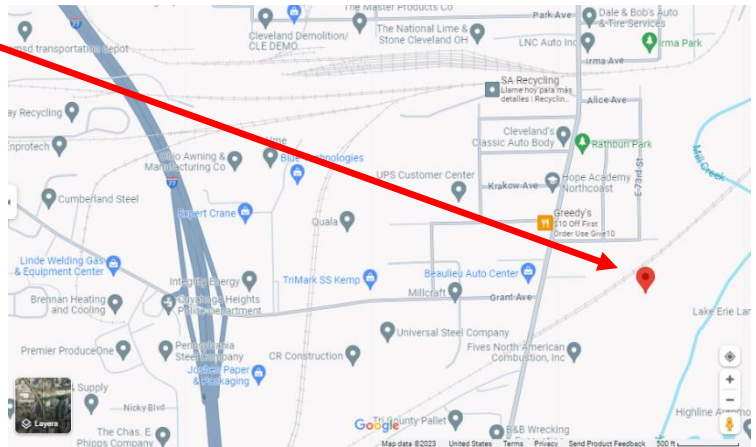
6:00 PM – Dinner

6:30 PM – Presentation with Tour

Dinner: ASM Members: \$25
Non-Members: \$30
Retirees: \$15
Students: \$5

Note: Each heat treater company gets one free representative registration.

Menu: N/A



RSVP Required with ASM at: REGISTER HERE

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Steam School is Back in Session

Interested in Exciting Children about Chemistry?

Each year our Section attempts to excite children in grades 2-6 about chemistry by creating a fun, hands-on, age-appropriate Program for them. It's our contribution to National ACS' celebration of National Chemistry Week (NCW) each October. Our Section's NCW Planning Committee selects a set of 4-6 of fun "experiments" for our Program which is presented by volunteer Demonstrators during NCW in October.

It's a lot of fun creating the Program and presenting it each year. If this might be something you might like to contribute your knowledge and time to, please consider volunteering for either the Planning Committee or as a Demonstrator. The time commitments are minimal: our Planning Committee meets twice each month between April and August for about an hour first via Zoom and later in person. Our Demonstrators commit to a couple of hours in October.

If interested in joining us or if you'd just like to learn more about us, please contact Bob Fowler at jrfowler@cox.net or at 216-403-9448.

ARTICLE, SEE July 3, 2023 ISSUE

On Electronic Materials: "C&EN Global Enterprise", <https://pubs.acs.org/doi/10.1021/cen-10121-cover>

BY [Craig Bettenhausen](#)

Electrolyzers: The tools to turn hydrogen green

The low-carbon hydrogen dreams of governments and corporations depend on the massive scale-up of this technology

Read the sustainability reports released by chemical companies, and you'll encounter one phrase over and over: "green hydrogen." That means H₂ produced by splitting water with renewable electricity. And it's not just the chemical industry. In materials, steel, biofuels, carbon dioxide utilization, heavy transportation, and even grid-level electricity supply, green hydrogen sits at the center of countless decarbonization plans.

But the truth is that green hydrogen barely exists. Less than 1% of the 10 million metric tons (t) of hydrogen produced in the US today counts as green, according to a [May 2023 report by Carbon Solutions, a greenhouse gas reduction consultancy](#).

Instead, 76% is derived from natural gas or coal, a process that emits as much as 18 kg of carbon dioxide for every kilogram of hydrogen produced, and 23% is a by-product of petroleum refining or other chemical processes. Globally, the hydrogen market is about 96 million t per year, with a similarly tiny portion made in a green way.

A multitude of challenges stand in the way of green hydrogen as a climate-saving workhorse, the first being the availability of renewable electricity. “You have to have that energy come from a green source to actually make it viable,” says Amanda Morris, a chemistry professor at Virginia Tech whose research includes catalytic materials for energy applications. “The solar capacity of the United States is nowhere close to being able to create a green hydrogen economy.”

Infrastructure is another hurdle, as hydrogen’s small molecular size lets it leak through pipeline and container materials that work fine for other gases. Most of the hopeful new applications for H₂ will also need to mature from pilot projects to commercial scale. And electrolysis will compete both with other low-carbon routes to hydrogen and with other uses for low-carbon electricity.

The industry will also need to build more electrolyzers—a whole lot more. Electrolyzers are the core pieces of a chemical kit that splits a mole of H₂O into a mole of H₂ and a half mole of O₂. The report from Carbon Solutions puts the number of electrolyzers operating in the US at just 42, with a combined hydrogen production capacity of about 3,000 t per year. The US Department of Energy (DOE) aims to have 10 million t of clean hydrogen flowing per year by 2030, 20 million t by 2040, and 50 million t by 2050. About half that production will come from renewably powered electrolysis.

And that’s just the US. The market intelligence group [Rethink Technology Research projects that by 2050, the global demand for clean hydrogen](#) will reach more than 580 million t. Blue hydrogen, made by converting fossil fuels to hydrogen and capturing and sequestering the resulting CO₂, is included in the definition of *clean hydrogen* used by Rethink and the DOE. But blue hydrogen enjoys weak support outside the US and [has a shaky track record for real greenhouse gas reductions](#), so most industry watchers expect green hydrogen to claim the lion’s share of global demand.

All that new hydrogen adds up to \$2 trillion in global electrolyzer purchases over the next 27 years, Rethink says. Those purchases will be the backbone of an annual green hydrogen market that could be worth \$850 billion...

ARTICLE, SEE September 11, 2023 ISSUE

On Infectious Disease: "C&EN Global Enterprise", <https://pubs.acs.org/doi/10.1021/cen-10130-feature1>

BY **Shi En Kim**

For long COVID, a growing understanding

Hannah Davis misses her old self. Like so many people around the world, she has seen her life upended by long COVID, which has made many once-routine activities impossible. The 32-year-old has stopped working at her job in the field of machine learning and generative models. It's too cognitively taxing; the lights from display monitors are disorienting. Merely standing up from a sitting position causes her heart rate to shoot to 170 beats per minute, the equivalent of doing a good jog.

"A phone that doesn't hold a charge" is how Davis describes how she feels. "Keep plugging it in and keep plugging it in, and then it'll just last 20 minutes."

There are multiple terms for what Davis experiences: postacute sequelae of SARS-CoV-2, post-COVID conditions, chronic COVID, and long COVID—the most popular name. She is one of an estimated 65 million people worldwide still suffering from COVID-19's fallout weeks to months after their initial infection with the virus SARS-CoV-2.

About 10% of those who contract the virus end up with several of long COVID's 200 documented symptoms. The most debilitating of these include the prolonged physical exhaustion known as myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS); cognitive impairment; and postural orthostatic tachycardia syndrome (POTS), which involves the dysregulation of the body's background systems, such as heart rate. Some eventually recover fully, but many are still grappling with the aftereffects.

As disruptive as her long COVID is, Davis hasn't looked back, and she is taking charge of her own fate. Just months after the start of the pandemic, she and others with long COVID founded the Patient-Led Research Collaborative, an advocacy and research organization that seeks to accelerate new findings on long COVID and spread awareness about the latest treatment options.

So far, no treatment has been approved specifically for long COVID. And the syndrome is still an enigma to many researchers because of the sweeping physiological changes that accompany it. "There are so many different syndromes underneath that lead me to believe that there might be multiple underlying causes," says physician William Q. Pittman, assistant director of the Long COVID Program at UCLA Health, part of the University of California, Los Angeles.

But thanks to tireless efforts by scientists and patients such as Davis, researchers are starting to illuminate the biological underpinnings of the disease, and candidate treatments are already advancing through the clinic. Over 300 long-COVID studies from research institutions and drug companies alike populate the US government clinical trial registry. Those trials should provide more clues to how long COVID wreaks havoc in the body and how it might one day be countered...

ARTICLE, SEE August 28, 2023 ISSUE

On Climate Change: "C&EN Global Enterprise", <https://pubs.acs.org/doi/10.1021/cen-10128-cover>

BY **Carrie Arnold, special to C&EN**

Pristine or polluted?

Pollutants are contaminating the Arctic. Climate change could make it worse

For the 300 polar bears that call Svalbard, Norway, home, the rocky archipelago between the top of Norway and the North Pole is a relative oasis. Because Svalbard is the only scrap of solid ground for hundreds of kilometers, polar bears rely on it to build their dens and hunt reindeer. At first glance, the bears live in a pristine, seemingly barren world of ice and snow. Aside from occasional run-ins with the roughly 3,000 people who call the islands home, the bears seem far removed from the world of humans.

So when William Frederik Hartz and other environmental chemists from the University of Oxford found sky-high levels of per- and polyfluoroalkyl substances (PFAS) in Svalbard's ice and snow, the researchers were alarmed (*Sci. Total Environ.* 2023, DOI: [10.1016/j.scitotenv.2023.161830](https://doi.org/10.1016/j.scitotenv.2023.161830)). Those chemicals pose a direct threat to polar bears—and humans.

"The levels in Svalbard polar bears are actually equivalent to [those of] people living near fluorochemical factories in China," says Hartz, now at the Climate and Environmental Research Institute "It's really [unbelievable] to me that something living in a remote Arctic environment can be as contaminated as some of the most-exposed people on earth. It really demonstrates how far PFAS problems travel."

Svalbard hosts only a small amount of coal mining and an airport, so the chemicals have to be coming from elsewhere. Crispin Halsall, an environmental chemist at Lancaster University who wasn't involved with the Svalbard study, has a pretty good idea where: everywhere.

Over the past several decades, scientists have found that the Arctic acts as a chemical sink for many persistent organic pollutants (POPs), as well as other contaminants, such as mercury and microplastics. Ocean currents and atmospheric patterns transport these pollutants from lower latitudes to the poles and trap them there.

But as scientists learned about the long-range transport of chemicals to the Arctic, climate change began to shift the environmental dynamics. When long-frozen permafrost, glaciers, and sea ice melt, they release compounds that have been locked away for decades into marine and terrestrial environments. Reductions in the environmental concentrations of these chemicals have stalled and, in some cases, reversed.

Researchers predict that the Arctic could experience ice-free summers as soon as 2030 (*Nat. Commun.* 2023, DOI: [10.1038/s41467-023-38511-8](https://doi.org/10.1038/s41467-023-38511-8)). Understanding the future of the Arctic, Halsall says, will require chemists to untangle the interactions between the transport of pollutants to the poles and climate change. But as global climate change accelerates, some scientists are asking whether they can learn in time to halt disaster...

ARTICLE, SEE Spring 2023 ISSUE

On Artificial Intelligence: "PE Magazine", <https://www.nspe.org/resources/pe-magazine/spring-2023/the-chatter-about-ai>
BY DANIELLE BOYKIN

The Chatter About AI

[The growing presence of generative AI chatbots energizes discussions about emerging tech and engineering practice.](#)

OpenAI's ChatGPT came on the scene in November 2022. This generative artificial intelligence technology processes written or spoken human conversation and can generate information in response to various queries and requests. This type of generative AI has made a noticeable impact in a brief period of time and other versions of chatbots (Bard, Bing, ChatSpot, Drift, etc.) have been released. And just in case you're wondering, this article was not written with the assistance of a chatbot.

A discussion about artificial intelligence and ChatGPT recently took place on the [NSPE Communities' Open Forum](#) (Will AI Take Your Engineering Job?) with varying perspectives on AI and what effect it could have on the engineering workforce. Can this tech be useful with some aspects of engineering design? Will this technology be a "job killer" or replace engineers? The conversations also reinvigorated a discussion about what role licensed professional engineers should take on in the development and deployment of artificial intelligence and other emerging technologies.

According to a Deloitte AI Institute report, "generative AI has the potential to add contextual awareness and human-like decision-making to enterprise workflows, and could radically change how we do business." This led Deloitte to launch a new practice to advise clients on the transformative impacts of this technology and help them plan, build, implement, and operationalize solutions built on the leading foundation models. The report also warns that this AI technology is in its infancy and could pose risks related to privacy and security, managing bias, transparency and traceability of results, IP ownership, and equal access, especially for those at greater risk of job displacement.

Ben Amaba, Ph.D., P.E., LEED AP, CPIM, is no stranger to how artificial intelligence and other emerging technologies can have an impact on various industries and organizations. During a conference session at NSPECon22 in Philadelphia, he discussed the use and misuse of artificial intelligence in critical infrastructure systems and the importance of ensuring safety.

New technology and process improvements are essential for growing economies and improving the quality of life, says Amaba. He doesn't believe that this type of AI will put engineers, particularly licensed professional engineers, out of their jobs. "Innovation and advancements will continue to drive change in the workforce, just as the agricultural and industrial revolutions did in the past. However, it's crucial to put the appropriate guardrails in place to protect the public's welfare," says Amaba, who serves on the NSPE Board of Directors and is a Fellow with the Institute of Industrial and Systems Engineers. "We must

ensure that these changes are implemented responsibly and with consideration for the potential impacts on society."

NSPE supports emerging technologies in a manner that protects the health, safety, and welfare of the public through rigorous development, testing, and deployment of emerging technologies involving licensed professional engineers at each step of development ([Professional Policy No. 03](#)). NSPE recognizes the benefits of continued research and development that safely advances emerging technology while minimizing risk. Society volunteers and business entities are directed to implement this policy in relevant position statements, operating procedures, and business practices...

ARTICLE, SEE July 2023 ISSUE

On The Energy Transition: "CEP, Chemical Engineering Progress",

<https://www.aiche.org/resources/publications/cep/2023/july/special-section-energy-transition-importance-carbon-intensity-and-compliance-meet-decarbonization>

BY **KRISTINE KLAVERS**

Special Section: The Energy Transition: The Importance of Carbon Intensity and Compliance to Meet Decarbonization Goals

Determining a product's carbon intensity is the first step in understanding the value of that product and taking advantage of the carbon markets and carbon credits available to companies today.

The long road to net-zero carbon emissions is necessarily a collaborative effort between policymakers, industry, and consumers. To achieve this broad and ambitious goal, it will take considerable time to develop a framework for stakeholders to adopt. The U.S. Clean Air Act began reducing greenhouse gas emissions decades ago and opened the way for future environmental initiatives, and with each proposal came further refinement of the tools needed to measure and report emissions.

With regulations often changing, it is likely that many stakeholders take a forward look at the carbon markets and forget how much progress has already been made. The names involved in some of the most important milestones may sound somewhat anachronistic; remember, California's Low Carbon Fuel Standard was signed into law by Governor Arnold Schwarzenegger and the Renewable Fuel Standard was signed into law by President George W. Bush. This era of incremental progress included the Kyoto Protocol, which created a carbon emissions trading market; and the Paris Agreement in 2015, which, after the readmission of the U.S., covers over 98% of human emissions and marked the strongest global commitment to net-zero carbon emissions. California's Low Carbon Fuel Standard in particular can be considered an environmental policy juggernaut. This program puts a price on altruistic commitments, and that price hinges on two important details for anyone in the transportation fuel supply chain that wants to participate in the program: carbon intensity (CI) and compliance.

Reducing the CI, or decarbonizing, the global supply chain will require bigger partnerships between investors, manufacturers, and shippers. Nearly everyone in the supply chain will have to be involved because everyone will be auditable for their contribution to a final product's CI. "Responsibility" in this context will account for more than direct emissions. Consider the breadth of those responsibilities involved in the following emissions:

- Scope 1 emissions are direct greenhouse gas emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles).
- Scope 2 emissions are indirect greenhouse gas emissions associated with the purchase of electricity, steam, heat, or cooling.
- Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly affects in its value chain like business travel, water, and waste treatment.

With responsibilities covering the entire supply chain, there are now new drivers for decarbonization solutions. Industry financials and progress are no longer driven by simple economic principles like supply and demand. Customers, industry, and governments are pushing for increased sustainability and circularity. Carbon-neutral and net-zero carbon pledges have proliferated within company messages. Thousands of companies have committed to net-zero targets, but different baselines, methodologies, and calculations often make the results of these commitments murky...

CANCELLED: Steam in the Valley, Cuyahoga Valley Scenic Railroad (CVSR), September 2023



Due to potentially changing conditions and the inability to reschedule other events, CVSR has made the very difficult decision to postpone Steam In The Valley until 2024. We understand how disheartening this is for the thousands of guests that look forward to this event each year. We are equally disappointed, yet are hopeful for the steam engine's return sometime next year.

Travel Back in Time with Steam in the Valley

Steam in the Valley

Steam in the Valley is an annual tradition at Cuyahoga Valley Scenic Railroad. CVSR partners with Fort Wayne Railroad Historical Society to bring the historic Nickel Plate Road Steam Locomotive No. 765 to the Valley for an unforgettable experience.

This is a limited opportunity to ride the train while being powered by a historical steam locomotive. Passengers will have the opportunity to disembark the train and view a once-in-a-lifetime run by of the high-stepping, fourteen-wheeled, time machine that stands 15 feet tall and weighs 404 tons.



CLE AIChE: Cleveland Chapter

Fall 2023 – Spring 2024 Program Planning

(Preliminary as of 26Sep2023)

Month	Topic, Speaker	Location	AIChE Officer Responsible
September 8, 2023 (Friday 6 PM)	Oktoberfest Social Event	German Central Farm, Parma	Joe Yurko, \$7/guest admission + \$ food & beverage? https://germancentralfoundation.com/oktoberfest
October 11, 2023 (Wednesday 6 PM)	Brewery Tasting Tour	Market Garden Brewery, OH City	Mike Galgoczy, \$20/guest with 20 guests. Dinner: 7 PM Market Garden Brewpub & Restaurant.
October 30, 2023 (Wednesday 5:30PM)	ASM Joint Meeting: Heat Treater's Night H2 effect on heating metals, Justin Dzik, PE	FIVES North American Combustion, Inc., Talk & Tour	Joe Spagnuolo & Joe Yurko: \$30 Non-members, \$15 Retirees, \$5 Students. https://www.fivesgroup.com/energy-combustion
November 14, 2023 (Tuesday 6 PM)	History of ACS 7-National Chemical Landmarks Sites in Cleveland, Helen Mayer Speaking	The Sanctuary, Rockside Road Independence	Joe Yurko, Dinner menu ordering for professional members, Students cost: \$5 http://places.singleplatform.com/shulas-steak-house-8/menu#menu_5599999
December 2023	Nuclear Power and Decarbonization Update for Ohio, Andrew Ohrablo Speaking	Red Lobster, Parma, Day Drive	Joe Yurko, Dinner menu ordering for professional members, Students cost: \$5 https://www.redlobster.com/menu
January 2024	NASA Glenn Center Vertical Take Off & Landing (eVTOL) Electric Aircraft, JOBY, Dayton, OH	Donte's Restaurant & Pizza (NASA Area) 2085 Sheldon Road Brook Park, OH 44142	Joe Yurko, Dinner menu ordering for professional members, Students cost: \$5 440-243-0342, https://www.dontesrestaurantpizzashop.com
February	Process Hazard Analysis, Gurmukh Bhatia Speaking	Burntwood Tavern, 8188 Brecksville Rd Brecksville, OH 44141	Joe Yurko, Dinner menu ordering for professional members, Students cost: \$5 Burntwood Tavern: 440-546-7680 Menu: https://www.burntwoodtavern.com/menu

