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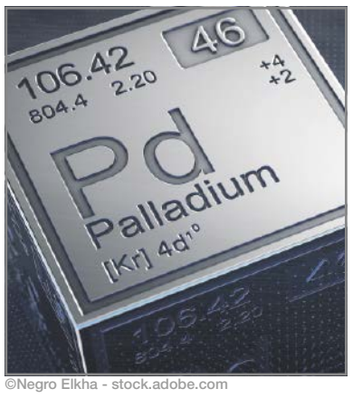

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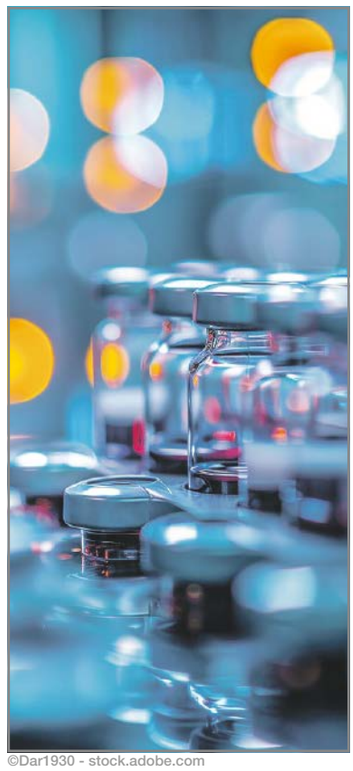

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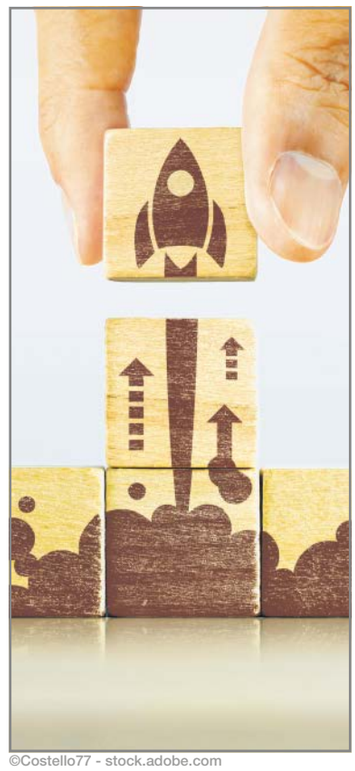

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Markets & Strategy

Fine & Speciality Chemicals

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Innovation

Trying Times and a Wave of Light

CEFIC President Ilham Kadri on the Antwerp Declaration and Championing Europe's Industrial Revival

A struggling industry in Europe, a new group of European policy makers, and a movement that has united 25 industry sectors in calling for the business case for investments in Europe. Ilham Kadri, CEO of Syensqo and the newly-instated President of the European Chemical Industry Council, CEFIC, shares the industry's status quo and the latest on the Antwerp Declaration for a European Industrial Deal.

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Ilham Kadri, CEO of Syensqo and President of CEFIC

CHEManager: Ms. Kadri, first of all, congratulations on your appointment as CEFIC President. Can you provide us with a snapshot of the European chemical industry today?

Ilham Kadri: Thank you, I am honored to represent the European chemicals industry in what I believe can be a defining period for industry at large. Looking back over the past five years, I have seen our industry fully embracing its transformation journey. Back in 2020, we were one of the first to come out in support of the EU Green Deal. Today, this is our bread and butter.

> "Industry needs the business case to invest in Europe."

Yet, let's not underestimate the scale and speed needed for this transformation, it is simply enormous for an industry like ours. The chemicals industry is quite specific in this regard, for our industry we need to change not only what we produce, but also how we produce, all in less than 30 years. And we are impacted by each angle of the transformation; as we go climate-neutral, circular, digital, and transition to safe and sustainable chemicals.

Without chemicals there is no Green Deal. The chemicals industry is the mother of all industries. Whether you look at wind turbines, batteries, insulation, recycling technologies, all these materials depend on chemicals. With the EU Green Deal our industry has agreed on what we need to achieve. The green and digital transformation aspects are clear, yet there have been recurring questions on how can we achieve this. Not least while remaining competitive and resilient here in Europe.

Practically, what is needed to move towards building a sustainable, competitive and resilient industry in Europe?

I. Kadri: This is what gives me great pride: our industry did not wait to be given the answers. We took the lead in developing the 'Antwerp Declaration for a European Industry Deal' to complement the EU Green Deal. Now co-signed by around 1,200 organizations, it lays out how Europe can achieve its sustainability goals, while remaining resilient in face of dependencies and geopolitical tensions, and competitive against global players.

We are heading towards a new EU institutional cycle after the European Elections where a new European Parliament has been elected and subsequently new leaders in the European Commission will be chosen. I believe this is a year when change can, and must, be possible! The Antwerp Declaration lays the foundation for our new European leaders to support a strong industry while keeping quality jobs in Europe. I am immensely proud of this development, and it is my ambition to make sure these calls are carried over and support an industry that thrives in Europe.

You have alluded to the challenges facing industry, can you tell us more about this and how the Antwerp Declaration responds to it?

I. Kadri: Right now, I hear the worrying calls of industry leaders, of large and small companies, that Europe is quickly losing its competitive edge. So, the key and overarching message of the Antwerp Declaration is: industry needs the business case to invest in Europe. Outsourcing production to other regions will not help Europe become more sustainable, resilient, competitive. We need to keep a competitive industry and quality jobs here in Europe and show the rest of the world that the Green Deal can work.

Yet economic signs point in another direction: take last year for example, the EU27 chemicals industry experienced a decline of 8% in production compared to 2022, and chemical exports to the rest of the world fell by €16 billion. At the same time, I saw in the EU Commission's Strategic Foresight Report that about €620 billion of public and private investments are needed yearly to deliver the European Green Deal and the REPowerEU Plan.

This brings the question: how can we accelerate a costly transition, when figures show that large and small companies have faced the most severe economic downturn in a decade? Here lie the calls of the Antwerp Declaration: we need clarity, predictability and confidence in Europe and its industrial policy.

Could you explain in more detail what the Antwerp Declaration says, please?

I. Kadri: The declaration lays out ten action points. In summary, we want to see an Industrial Deal embedded into the structure, budget and fabric of the next institutional cycle's programs and strategic agenda. So, one of our key asks is to have a Vice Commission President who oversees the moving parts across the Commission ensuring that policies are effectively implemented and everything works together seamlessly.

"The Antwerp Declaration has turned into a movement."

The Declaration also calls for self-sufficiency in raw materials and for measures to boost demand for sustainable products. We want to see innovation at the heart of our efforts, driving progress and new solutions which are not only discovered in Europe but also scaled up and supported here too. As it states "Europe must remain a continent of industrial production".

Importantly, the urgency to go climate-neutral is growing each day, and if we want to move quickly, we need a simplified, efficient and agile regulatory system, while maintaining the bar on safety and environmental protection. We need to cut the red tape and make it easier for industry to invest right here on European soil.

The Antwerp Declaration has created huge momentum for an industrial deal. How do you see the developments on the ground?

I. Kadri: Just a few months ago, together with 73 CEOs, we presented the Antwerp Declaration to Belgian Prime Minister Alexander De Croo and Commission President Ursula von der Leyen. Today, around 1,200 organizations across 25 sectors have joined us in support. A strong dialogue is in place, in particular with the Unions. This is an achievement in itself as it sends a clear message to policy makers that industry is united in its call: We need a strong Industrial Deal to complement the EU Green Deal and safeguard quality jobs in Europe.

The Antwerp Declaration has turned into a movement. Competitiveness is becoming one of Europe's most talked-about topics and top priorities. We see notions of the Antwerp Declaration resonating in the Competitiveness Council conclusions, throughout Enrico Letta's high-level report on the Single Market. It was even referenced in a joint statement by France's economic and finance minister, Germany's economic minister, and Italy's minister for businesses after they discussed how to increase European competitiveness and productivity.

"Competitiveness is becoming one of Europe's top priorities."

Quite an achievement in a short period of time. And what's next

I. Kadri: Now is not the time to sit back. I want to see industry continuing to keep competitiveness at the forefront of the next European Strategic Agenda and Commission work program. At the same time, with the signatories, CEFIC is rolling out deep-dive discussions with various stakeholders to go into further detail what is meant by the different references in the Antwerp Declaration. For instance, we recently held a dialogue with civil society on climate and energy issues, with experts on how to boost biotech in Europe, and with unions on how Europe can ensure quality industrial jobs in Europe.

I believe this approach is an open and solution-oriented way to kick-start the next phase of the EU cycle and ensure that the voices of industry and the millions of workers it employs are heard.

Arguably more important are the European elections where all EU citizens have had the chance to share their views and shape the future of the next EU agenda. I hope everybody took this opportunity and used their vote. I look forward to sharing updates in the coming months.

- www.cefic.org
- www.antwerp-declaration.eu

Using Chemistry to Create Net-Zero Value Chains

The Global Impact Coalition (GIC) Enables the Co-Creation of Net-Zero and Circular New Business Models

First established in 2019 within the World Economic Forum (WEF) as the Low-Carbon Emitting Technologies (LCET) initiative, the CEO-led Global Impact Coalition (GIC) was officially launched as an independent entity by seven global chemical companies in November 2023. Focused on reducing carbon emissions and advancing circularity in the chemical industry, the GIC provides a platform to co-create new business models, develop proof-of-concept pilots, and scale-up new technologies. One such project is the recently launched R&D Hub, aimed at advancing new plastic recycling methods. In an interview with CHEManager, Charlie Tan, CEO of GIC, explains the ambitions and activities of the organization.

© Global Impact Coalition

Charlie Tan, CEO, Global Impact Coalition

CHEManager: Mr. Tan, could you share the vision behind the Global Impact Coalition (GIC) and the key goals you aim to achieve in the near future?

Charlie Tan: The Global Impact Coalition started life within the World Economic Forum, or WEF, in 2019, as the Low Carbon Emitting Technologies, or LCET, initiative. Recently, in November 2023, we spun-off and created an independent non-profit entity known today as the Global Impact Coalition. The GIC was founded by seven industry-leading chemical companies — BASF, SABIC, Covestro, Clariant, LyondellBasell, Mitsubishi Chemical, and Solvay — now Syensqo.

The vision was really centered around one question: As we go on this journey towards industry net-zero — do we need to go alone, or can we go together? The GIC has had great success in being a platform enabler to allow companies a safe space to co-create and co-develop innovative business models and technologies that otherwise might not have been possible.

Since GIC's inception a few months ago, the industry response has been extremely positive. We welcomed new members including Siemens Energy, and Sabanci, one of the largest industrial conglomerates in Turkey. The vision is to continue to expand globally, both in terms of geographical reach and value chain representation, as it is only by achieving these can we have true impact.

Personally, one of my goals with GIC is to create a unique environment of mutual trust within an industry that traditionally has not been big in collaboration. It is only through creating this trust can we can enable real transformation across the industry.

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What are some of the significant projects that the GIC is currently working on? How do these projects contribute to the overall mission of the coalition?

C. Tan: At the heart of the GIC's mission lies a commitment to catalyzing innovation as a means to drive real impact. By leveraging collaboration among member companies and building other strategic partnerships, the GIC has managed to advance a diverse and exciting portfolio of projects aimed at addressing critical emissions challenges.

Among one of our initial projects is the R&D Hub for Plastic Waste Processing. The R&D Hub, co-funded by seven coalition member companies, focuses on developing technologies with lower carbon footprints and greater levels of plastic waste recycling. We are well aware that with less than ten percent of the 400 million tons of plastic produced annually being recycled, there is an urgent need for innovative solutions to enhance waste processing and recycling capabilities. Some examples of technologies being explored include sensing for sorting, polymer/inorganic separation, and enhanced solvolysis for composite recycling.

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Another great example project between GIC member companies is the electrically heated steam cracker furnace, a collaboration between coalition members BASF and SABIC, and engineering firm Linde. Construction of the three companies' world first demonstration plant for large-scale electrically heated steam cracker furnaces is in full swing. By using electricity from renewable sources instead of natural gas, the new technology has the potential to reduce carbon emissions of one of the most energy-intensive production processes in the chemical industry by at least 90 percent compared to technologies commonly used today.

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Richard Haldimann, Chief Technology & Sustainability Officer at Clariant and Chairman of the Executive Committee of GIC

"The sustainability challenges facing the chemical industry are too large for any one company to tackle alone. Through the Global Impact Coalition, we are combining our capabilities and resources to accelerate innovation, a key driver to transform our companies and value chains in line with planetary boundaries."

How do you measure the impact of the GIC's initiatives? Can you share any success stories or key milestones that the coalition has achieved?

C. Tan: The GIC's impact over its initial three-year incubation period has been remarkable, leading to the emergence of spin-off initiatives alongside the above-mentioned projects, with many more in development.

"The chemical industry faces a challenge in transitioning towards net-zero emissions."

As a newly established organization, we are focused on amplifying our impact by fostering and strengthening partnerships with universities, research institutes, and professional firms.

Reaching industry net-zero goals does not rest on the shoulders of private sector companies alone; regulators and the broader financing community also play a crucial role in enabling this transition. Given our continued strong partnership with the WEF, this is something we are working on with high motivation.

How does the GIC plan to cut the chemical industry's annual greenhouse gas emissions to reach net-zero emissions by 2050?

C. Tan: The GIC serves as a catalyst for collaborative action, bringing together industry leaders, policymakers, and stakeholders to address pressing environmental challenges. Through strategic alliances with organizations like the Boston Consulting Group, the GIC has identified key global impact topics relevant to the chemical industry. These encompass a spectrum of issues, including decarbonization of processes, reduction of high global warming potential emissions, energy transition enablement, circularity of polymers, utilization of alternative carbon sources, and chemical safety and pollution.

By convening member companies on a regular basis, the GIC actively identifies and prioritizes project ideas aimed at tackling these challenges head-on. With a portfolio comprising over 25 project ideas, the coalition is steadfast in its commitment to translating prioritized projects into tangible outcomes.

In your view, what are the biggest challenges and opportunities in transforming the chemical industry towards net-zero emissions?

C. Tan: The chemical industry faces a massive challenge in transitioning towards net-zero emissions. Key challenges include the development and deployment of new emissions-reducing technologies, securing capital investment for infrastructure upgrades, navigating complex regulatory landscapes, and coordinating efforts across intricate supply chains.

Ultimately, success in achieving net-zero emissions hinges on a mindset and openness shift towards sustainability within the context of collaboration. In this journey, the Global Impact Coalition plays a pivotal role as a catalyst for collaboration and innovation within the chemical industry. The GIC enables member companies to leverage collective expertise, resources, and networks, accelerating progress towards achieving net-zero emissions targets.

How do you envision the role of the chemical industry in a sustainable future?

C. Tan: The chemical sector contributes approximately six percent of global annual greenhouse gas emissions.

If we are to move towards a more sustainable future, I truly believe collaboration is the key. The chemical industry must forge partnerships across sectors, leveraging collective expertise to tackle complex sustainability issues. From collaborating with downstream partners to optimize product life cycles, to partnering with academia and governments to drive research and policy innovation, a collaborative approach is essential for meaningful progress.

"If we are to move towards a more sustainable future, I truly believe collaboration is the key."

Partnerships are crucial in realizing this vision. In the GIC, we recognize the power of collaboration to drive meaningful change. That's why we are partnering with leading research institutes like the Netherlands-based TNO and clusters such as Brightlands Chemelot Campus. We're also collaborating with universities from around the world and with partners like EY, enabling us to reach a broader audience within the industry. Through these strategic alliances, we aim to accelerate innovation, foster knowledge exchange, and catalyse the transition toward a more sustainable future for the chemical industry and beyond.

Collaboration is at the center of the GIC's approach. Can you share how GIC helps foster industry collaboration to achieve its goals?

C. Tan: At the GIC, we understand that achieving our goals requires a collective effort. That's why we've implemented a robust governance structure, which includes the CEO Advisory Board and an Executive Committee who help steer a top-down approach to getting things done.

„Partnerships are crucial in realizing this vision."

Furthermore, our collaboration with the World Economic Forum remains integral to our mission. Through co-hosted events, joint communications, and partnerships with WEF members, we maintain a strong connection with the broader stakeholder community both private and public.

To facilitate collaboration within the GIC and beyond, we host a diverse range of events, workshops, community meetings, and ideation sessions. These platforms provide opportunities for stakeholders at all levels to come together, share insights, and co-create innovative solutions. By nurturing open dialogue and knowledge exchange, we foster an environment where groundbreaking ideas can thrive.

Additionally, the GIC actively engages in external events such as COP — the United Nations Climate Change Conference –, the WEF Annual Meeting in Davos, and the World Petrochemical Conference (WPC). These engagements enable us to connect with industry peers and stakeholders, expand our collaborative network, forge new partnerships, and contribute to the global dialogue on sustainability in the chemical industry.

■ www.globalimpactcoalition.com

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Introducing AGI Glassplant Sakura Pilot Reactors — Sakura and Sakura Mini. These next-generation premium pilot reactors offer everything you need to scale up your chemical process with ease, employing the latest reactor vessel technology to ensure enhanced performance and improved efficiency.

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Sakura

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- Optional Ring Baffle Vessel Technology upgrade
- Efficient scale-up
- High performance stirring
- Liftless stirrer coupling

Sakura Mini

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- Quick vessel switch-out
- Small footprint
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- Liftless stirrer coupling

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Sakura and Sakura Mini integrate seamlessly with the AGI Glassplant Pilot Reactor Controller. The Pilot Reactor Controller oversees every stage of your process, giving you precise control, automation and replicability to streamline workflows and free up valuable time.

Visit **go.agi-glassplant.com/sakura** to learn more about Sakura Pilot Reactors.

AGI Glassplant

Decarbonizing for a Sustainable Future

A Collaborative Effort to Reduce Emissions along the Supply Chain

Reducing greenhouse gas (GHG) emissions in the supply chain lies outside of a company's direct control, so collaboration with suppliers and partners in the supply chain is key. Yet, challenges to reduce such emissions are still abundant.

The good news is that the challenges are predominantly the same across companies and industries and collaborating with peers allows for a faster and more effective adoption of solutions. Most companies still face significant awareness and knowledge gaps within their own company. It is thus not surprising to encounter similar situations when talking to suppliers and partner companies. Required technical understanding, such as GHG accounting methodologies as well as insights into available effective measures to reduce emissions in the supply chain, is not thoroughly in place within companies across the supply chain.

Closing those expertise gaps requires organizations to invest time and resources in skilling-up. Clear guidance from the top management is a prerequisite to drive the necessary changes within each company. To effectively drive emission reduction, access to reliable emission data along the value chain is essential. Lacking standardized formats for GHG calculation and reporting, as well as the absence of automated tools for gathering and sharing emission data currently still prevents emission transparency across the supply chain. Resulting unharmonized data requests from multiple customers are often overwhelming for suppliers.

Driving Impact through Industry Collaborations

By playing an active role in several industry initiatives, such as Together for Sustainability (TfS), Pharmaceutical Supply Chain Initiative (PSCI), Sustainable Markets Initiative (SMI), or Sustainable Procurement Pledge (SPP) — just to mention a few — Merck aims to address the outlined common challenges by joining forces with our peers, creating impactful solutions and enablement for our suppliers, our customers and ourselves. Some examples:

Through PSCI and the TfS Academy our suppliers have access to a broad range of sustainability trainings and exchange with others free of charge. Specific and detailed training curricula on decarbonization for beginners up to mature companies have been added in the past years to the long-time existing training offering.

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Verena Buback, Merck

Within SMI and PSCI, we aligned our sustainability requests towards suppliers and jointly provide access to renewable electricity opportunities via the Energize Program.

Within TfS, suppliers complete sustainability assessments only once and the outcome is shared with all TfS member companies, reducing significantly the efforts on both suppliers' and customers' sides. We played an active role in launching and promoting the TfS Guideline for Product Carbon Footprints (PCF) calculation. Lacking

"We are convinced that partnerships are key to success."

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Global Supplier Decarbonization Program

Merck's ambitious commitments to sustainability include to meet a science-based climate target by 2030. To address the about 50% of the Darmstadt, Germany-based company's corporate emissions which arise from the supply chain, Merck launched the global supplier decarbonization program in 2021 to reduce greenhouse gas (GHG) emissions jointly with suppliers. In addition, Merck collaborates with peers in industry initiatives to shape common standards and provide tools and resources enabling suppliers to effectively reduce emissions.

harmonization before, PCF calculations are now possible to be performed in a standardized manner across the industry. We are piloting the PCF exchange solution SiGreen to automize the currently manual data exchange with suppliers next year.

"Reducing greenhouse gas emissions in the supply chain lies outside of a company's direct control."

Through SPP, good practices how to embed sustainability into procurement practices are made available to anyone interested without financial membership requirements. Peer group exchanges help learn from others, stay up to date with the manifold solutions in the context of decarbonization popping up every day and allow to build a network with like-minded partners to drive decarbonization together.

Supplier Decarbonization Program: Best Practices and Lessons Learned

Before launching the supplier decarbonization program, we first dedicated time to skill-up our own organization and enable sourcing teams to embed decarbonization as a regular topic in sourcing discussions. It was also imperative to align the program with our company's sustainability strategy and business ambitions. We built an internal network across the different businesses and corporate departments to regularly align and exchange on strategy, measures and progress.

Our procurement department is responsible for calculating the emissions for purchased goods and services as well as capital goods. Creating transparency on the emission hotspots in our supply chain led to the identification of most relevant suppliers to include in the program. As a first step, we engaged with the selected suppliers directly, introducing our sustainability goals and the program and sought to understand each supplier's current maturity status in term of decarbonization in order to tailor and define future steps together.

Some suppliers were more advanced than we were at the time, and we were lucky they shared their experience and good practices with us. Others were eager to learn from us and appreciated the resources and solutions we offered via our membership in industry initiatives. To some suppliers the topic was rather new, and we focused on raising awareness and receiving commitment for a joint approach to reduce emissions. Later, we added more suppliers to our program. By using a simple automized survey to understand the actions suppliers take, we are able to monitor the progress and derive concrete next milestones.

Sourcing managers have sustainability progress as part of their individual objectives. One important element of the program is to continuously evolve our GHG accounting methodology towards more data quality and accuracy. By integrating more and more data provided directly by our suppliers, we can gradually replace the general estimates we had initially used by applying standardized data base information.

Integration of Sustainability Requirements as a Decisive Factor into Procurement Practices

While effective supplier engagement and enablement is at the core of our program to reduce emissions, the key to success is the integration of sustainability requirements as a relevant factor into procurement practices. Our sustainability requirements are reflected in our Supplier Code of Conduct. We include sustainability aspects in requests for proposals and agree specific commitments with suppliers as part of our contracts.

Sustainability topics and measures to reduce emissions are part of regular discussions with our suppliers. Progress towards our decarbonization goals is regularly monitored and shared with the Merck Sustainability Board. Despite the many challenges and high efforts needed to decarbonize, we are dedicated to improving our supply chain sustainability and reducing greenhouse gas emissions in our supply chain.

We are convinced that partnerships are key to success as it needs all stakeholders to contribute to the decarbonization of global supply chains. Through engagement with suppliers, implementation of innovative ideas, and utilization of standardized guidelines, we strive to do our part and make a positive impact on the environment while maintaining a sustainable and resilient supply chain.

Verena Buback,
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Sustainable Material Adoption in Industrial Sectors

Three Eye-Opening Statistics about the Use of Low-Carbon Materials

According to the World Economic Forum, the chemical industry is currently accountable for 8% of global industrial greenhouse gas emissions. Companies worldwide are working to lower this figure. However, a significant challenge lies in the fact that, according to CDP, nearly 77% of these emissions fall under Scope 3, which includes those generated indirectly from a company's value chain. Despite this challenge, the industry is actively exploring innovative methods to track, measure, and reduce carbon outputs across the value chain.

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This is why many are turning to the use of CO_2-reducing materials. These materials have lower carbon footprints than their conventional counterparts, thereby reducing total emissions generated throughout the production process.

To gain insights into how small-to-medium-size companies are utilizing low-carbon materials, IMCD Industrial Solutions conducted a sustainability survey. The results were eye-opening.

Limited Adoption of Low-Carbon Materials Today

The survey revealed that only 50% of respondents utilize low-carbon materials today. This is the lowest adoption rate of all sustainable material types surveyed; 58% incorporate biodegradables, 64% employ renewable sources, and 79% prioritize materials that promote people's health and safety.

Despite the industry's willingness to discuss emission reduction, significant challenges are limiting progress in the market. Among the 50% using low-carbon materials, 30% cite availability as their primary challenge. Currently, these materials are not widely produced, and production is confined to specific regions, exacerbating accessibility issues.

Of the remaining 50% not utilizing low-carbon materials, 30% plan to integrate them into their production in the next three years. When asked why they don't use these materials today, 37% claimed that good alternatives are not yet available to their industries. This can be attributed partly to the early stages of innovation and production. Limited testing and data available today make it challenging to integrate these materials into specific processes and technical requirements.

Furthermore, limited product carbon footprint (PCF) data complicates the selection process, with 27% citing uncertainty about which materials to adopt as their chief barrier. Additionally, only 13% of respondents consider themselves experts on low-carbon materials — again, the lowest proportion across sustainability areas covered.

Moving forward, it's clear that extensive efforts in knowledge sharing and data transparency are required to meet adoption targets within the next three years.

Pricing Is a Challenge, but Will Not Stop Long-Term Adoption

Thirty-three percent cited higher prices as their top challenge with low-carbon materials. This trend was consistent across the various types of sustainable materials surveyed; 50% expressing pricing concerns about renewable sources, 40% about biodegradables, and 26% about materials prioritizing people's health & safety.

It's widely acknowledged that sustainable alternatives tend to be more expensive than their fossil-based counterparts. This can be attributed partly to the early stages of research and development. As results become more available, processes can be optimized, leading to increased efficiency and reduced production costs. Additionally, the utilization of renewable raw materials in low-carbon material production contributes to higher prices. These materials are often scarce, dependent on weather or climate conditions, concentrated geographically, or require additional purification processes, all of which increases production costs. However, as competition amongst producers intensifies and economies of scale come into play, prices will decrease, thus lowering the barrier to entry.

Despite these pricing challenges, 57% expressed a willingness to pay more for sustainable alternatives if

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State of Sustainability

For its report "2024 – 2027 State of Sustainability", IMCD Industrial Solutions surveyed top customers around the globe on their insights into eight key topics deemed pertinent to sustainability in industrial sectors. A total of 272 respondents from 25 countries answered questions about some or all of the eight sustainability focus areas. If you're interested in learning more about the data referenced in this article, you can access the full report at bit.ly/IMCD-Sustainability.

they can prove the value to their business and measure sustainable impact. This indicates that the industry is not afraid to invest and that they do not expect sustainable alternatives to be the same cost as their counterparts. Furthermore, 27% are willing to pay more if their customer can absorb some of the end cost. Both insights prove that price is not truly the deterrent to sustainable adoption. In fact, only 6% indicated that budget constraints would prevent them from the adoption of sustainable alternatives altogether, an issue that was most prominent for businesses with fewer than 100 employees.

"Despite the industry's willingness to discuss emission reduction, significant challenges are limiting progress in the market."

In the years to come, more meaningful and constructive conversations are anticipated surrounding the costs associated with sustainable alternatives. This improved communication and information sharing within the industry could be just the push needed to incentivize the 84% who are willing to invest more in sustainability initiatives.

Environmental Impact Is Driving Adoption

Among those currently utilizing low-carbon materials, 42% identified environmental impact as the leading factor driving their adoption. Moreover, when asked about the added value of using these materials, 68% cited environmental impact, ranking it highest on the list where respondents could choose multiple options.

These findings were unexpected. It seemed more plausible that business considerations would outweigh environmental concerns. However, only 48% listed competitive advantage as an added value, while 35% chose regulatory compliance and another 14% checked labelling.

Environmental impact is influenced by various external factors, which can vary greatly by region. In EMEA (Europe, Middle East, and Africa), 45% identified environmental impact as their primary driver for adopting low-carbon materials, with 73% recognizing it as a value-add. Conversely, in the Americas (Canada, US, Mexico, Brazil), environmental impact was also cited as a top driver (37%) and value-add (55%), albeit with slightly less significance. Notably, in EMEA, regulations are often driven by environmental goals, leading to a stronger commitment to sustainability within the region.

As the industry's mindset continues to evolve and the benefits of low-carbon materials become more evident, it's expected that there will soon be a more pronounced alignment between sustainability benefits and business value.

Further references to this article can be requested from the authors.

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Formulating Innovative Concepts

The Value of an Extensive Application Lab Network

With more than 70 application labs across the world, Azelis works with both suppliers and customers to develop innovative product concepts. Custom formulations, product testing, regulatory compliance, and sales support are just some of the services the chemical distributor offers. Its expert teams also anticipate trends and work proactively to offer innovative solutions to new needs. CHEManager asked Matthias Hofmann, Group Innovation & Technology Management Director at Azelis, to provide an in-depth insight into the company's innovation activities and the underlying market trends.

CHEManager: Mr. Hofmann, by driving innovation, Azelis has evolved from a distributor to an innovation service provider since its inception. What role do your application labs play in this?

Matthias Hofmann: At Azelis, we are all driven by innovation — constantly striving to find efficiencies and place an increased focus on formulation, application support, and finding new possibilities through our lateral value chain. We work with many blue-chip principals, benefitting our innovation capabilities, and we have access to a comprehensive set of products, empowering our lab team with more formulation opportunities. Furthermore, our expert technical sales teams are seasoned chemical and technical application experts in their fields, meaning they can support customers with new ideas and improved ways of thinking.

Creative formulators and experienced application experts, our lab teams are the technical promoters of our product portfolio. They are key contributors with extensive knowledge of our chemical portfolio and continuously improve products and applications for customers. To ensure effectiveness, our lab managers train colleagues; act as technical consultants; and most importantly, they co-create with customers to develop market-oriented solutions. In other words, the application labs are tasked with finding answers, combining products, and generating formulations for innovative proposals.

Which market segments can Azelis cover with its network of application labs?

M. Hofmann: We are active in 12 market segments across life sciences and industrial chemicals, with 70+ application labs. Our life sciences labs are ready to respond to the fast-changing market they cater to, and operate locally for the most part, with customer requirements and consumer preferences varying from country to country. In life sciences, we have numerous labs dedicated to personal care, food & nutrition, pharmaceuticals & healthcare, home care & industrial cleaning, and agricultural & environmental solutions. Those dedicated to industrial chemicals take a more regional approach, since there are fewer local variations in this more specification-driven market. Our labs in industrial chemicals cater to, amongst others, CASE, lubricants & metalworking fluids, and advanced materials & additives. All labs contribute to and make use of our common knowledge management system for lab projects and formulations, facilitating knowledge sharing, thus creating synergies and cross fertilization opportunities.

Which have been the latest additions to this network?

M. Hofmann: With growth through M&A being a key part of our strategy, our lab capabilities constantly expand into new regions and market segments. Through a recent acquisition in Brazil, we strengthened our food and nutrition footprint with three new application labs, adding a bakery, beverages, and dairy and ice cream lab, upgrading our technical competence for the entire food market. These new labs, operating under one roof, are fully integrated into our network and have formed a true technical hub and competence center for the region.

Overall, what do you think are the predominant trends in formulation development?

M. Hofmann: We see the drive toward sustainability and cost-effectiveness happening across the board, and our teams work hard to present applicable solutions. To innovate with purpose, our organization established regional and market-specific lighthouse topics, fostering trend-oriented working and leveraging collaborative working in a decentralized network.

Working closely with all functions — from marketing and sales to the experts in the lab, we keep a close eye on the rapidly changing landscape and provide our principals and customers with the most up-to-date information on market trends. Two examples:

In personal care (PC), we see a trend in sustainable or vegan ingredients, using reduced or no water and minimizing packaging. Our PC team launched a waterless kit with prototypes to reduce water and packaging waste — including 'Sudsy Solid Shampoo' and 'Conserving Conditioner Bar.' Made without water, these formulations also aim to reduce the water needed during use.

In food & nutrition, consumers are looking for price parity and want something that brings value: sustainability, positive nutrition, or enhanced taste and texture. In line with this, we've seen more requests for meat replacements, and our Regional Competence Center for Meat and Meat Alternatives in Poland supports our customers with the expertise and tools needed.

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Matthias Hofmann, Group Innovation & Technology Management Director, Azelis

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What do you perceive as the most pressing needs and requirements of your customers?

M. Hofmann: Our customers are looking for creative, fast, and cost-efficient solutions to their market needs. They want to grow their market share in an increasingly competitive global market and look to our team to help. Through our extensive lateral value chain and

technical expertise, we can propose, test, and help roll out new, innovative, and sustainable solutions, supporting their competitiveness in the market. Our customers benefit from our one-stop shop approach, which saves time and money.

Is there an area in which Azelis would like to expand its expertise in formulation development?

M. Hofmann: We aim to be the leading solutions provider of sustainable ingredients, and this year, we will complete our concept of product sustainability. Our sustainability experts devised a methodology to evaluate and steer our entire product portfolio and this effort has led to improved formulation work and expertise around sustainability and sustainable offerings.

We want to formulate faster, leveraging knowledge, experience, and learnings shared through our global knowledge management system. Our labs are interconnected through our digital backbone, and we are now looking into employing AI to bring that knowledge to our teams in smarter ways.

This year, the company ran its first in-house program called 'Azelis Innovation Award'. What is the scope of this program?

M. Hofmann: We work hard to help customers with innovation, products or process improvements. To further encourage this, we launched the 'Azelis Innovation Award.' With 'innovation through formulation' a cornerstone of our strategy, we want to ensure our team is working together cross-functionally and cross-regionally. These internal awards emphasize that innovation is a team sport—with technical and commercial colleagues coming together to offer value to our business partners.

The awards were evaluated based on teamwork, sustainability, commercial success, and of course — innovation, and we received 70+ entries that went through regional and global panels. This year, the gold prize went to our team in Brazil for their high-protein coffee beverage that they helped their customer launch. Silver went to the team in Korea for their water-based florylpicoxamid formulation, and finally, bronze went to our team in Türkiye for their innovation projects around pectin in the gummy market.

Through the program, we saw people from all backgrounds coming together to proudly showcase their achievements, and we already look forward to what the second round will bring.

■ www.azelis.com

Innovation Through Formulation

Azelis Continues its Growth Trajectory

On Jan. 1, 2024, Anna Bertona took on the role of Group CEO at Azelis. Ralf Kempf asked Bertona to look back on her first six months at the helm of the chemical distributor and her further strategic plans for the company

CHEManager: Mrs. Bertona, when we spoke for the last time at the end of the previous year, you mentioned that Azelis' foremost focus would be on driving (organic) growth with its customers and principals. What has happened in this respect since the beginning of the year?

Anna Bertona: Indeed, organic growth is our main priority, and for this, we are working together to attune Azelis' building blocks, making sure we are on the right track to grow successfully and sustainably: I just presented a renewed purpose for the company during my last town hall, along with reviewed values, which now better represent the organization we have become. We are also sharpening our business strategy, to cater to the challenges and needs of today's markets. So, this year is all about realigning and gearing up for a new phase of organic growth.

Which developments, both among your customers and the distributors themselves, do you see as challenges for the sector – and which as opportunities?

A. Bertona: Where there's a challenge, there's an opportunity: We see new players arise backed by private equities, becoming stronger competitors, and this is what keeps us all sharp and lifts the industry profile. While certain principals are struggling with high production costs, inflation, and increasing sustainability policies, changes in the dynamics and competitiveness of these companies will be prompted and this again will present challenges and opportunities. Also, we see the strong push in the EU government toward sustainability as a great opportunity, as we are well advanced in this area and help our customers and principals reach their own sustainability targets and ambitions.

Amid economic and geopolitical challenges, chemical distributors face investment uncertainties. In which areas do you think investment is nevertheless essential?

A. Bertona: Although the two are not necessarily connected, the current situation is indeed more challenging for distributors. We have kept conversion

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Anna Bertona, Group CEO, Azelis

margins stable, so for Azelis, it is more about reallocating resources as well as leveraging organic and inorganic investments made in the past years.

Organically, we continue to invest in our technological capabilities throughout our global lab network to ensure our technical expertise and superior formulation abilities are ever supported by high-class equipment and technology.

Inorganically we invest in growth markets and white spots to complement organic growth, and we have the balance sheet to support this.

And, of course, we continue to invest in our people, attracting the right talents and helping them unfold their potential through training and personal development.

What initiatives does Azelis take to retain and develop existing employees and attract new talent?

A. Bertona: We want to attract and retain top-tier talent, so we are committed to helping them grow as people and professionals and keeping them motivated for a sustained career at Azelis.

Whenever there is an open position, we put our own people first: In 2023, 41.7% of our vacancies were filled by Azelis employees. By doing this, we encourage talent development opportunities: local, regional, and international moves, career advancements, and job rotation, which facilitate the effective utilization and development of talent within our organization.

We recently set up our first Center of Excellence in L&D, not only to install learning tracks and training programs for our teams, but to overall foster a culture of lifelong learning and continuous improvement, strongly encouraging knowledge-sharing and cross-collaboration.

Retaining talent is also about nurturing. We have launched a mental health and well-being program with which we want to reduce stigma and help preserve a healthy work-life balance among our workforce.

■ www.azelis.com

At the Cutting Edge of Innovation

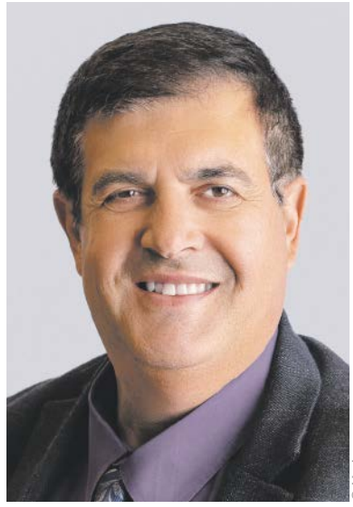
Leveraging Market Expertise to Deliver Success in Precious Metals Chemistry

The Belgian materials technology and recycling group Umicore is a specialist in the fields of material science, chemistry and metallurgy. The Precious Metals Chemistry (PMC) business unit is one of the world's most important suppliers of precious metal chemicals and catalysts for a wide range of industrial and commercial applications. CHEManager asked Phillip Chalabi, Umicore's director Strategic Projects and Innovation, about current trends in catalysis and the company's activities to accelerate the global transformation of mobility, respond to the growing need for advanced materials, and contribute to the pursuit of a global circular economy.

CHEManager: Mr. Chalabi, what are the most important (mega) trends in catalysis/catalyst technology these days?

Phillip Chalabi: While there are still significant efforts underway to develop improved catalysts for traditional known chemical transformations such as cross-coupling and enantio-selective reactions, much of the new focus is on sustainable chemistries that support the circular economy, ESG targets, and the energy transition. This includes catalysts required for hydrogen generation and transport as well as catalysts for CO_2 utilization. The future demands for high-performance and cost-effective catalysts will only increase.

How do you align Umicore PMC's strategy and activities along these trends?



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Phillip Chalabi, Director Strategic Projects and Innovation, Umicore

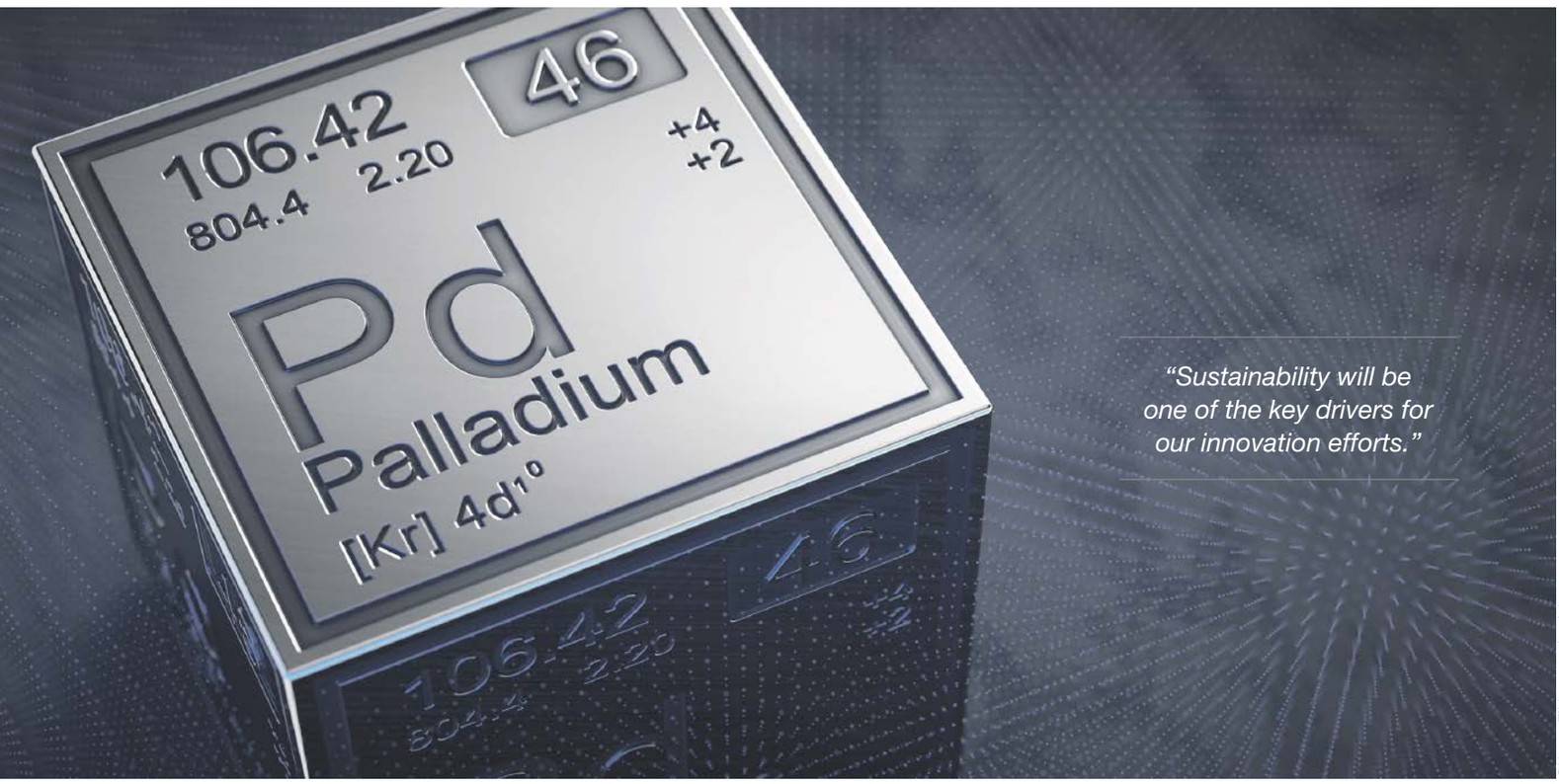
P. Chalabi: Umicore is working aggressively in many of these new areas. As the center of excellence for catalysis within Umicore, PMC has a key role in the development of the catalysts that will enable these new technologies to be enabled.

What are the drivers of innovation and progress in the markets in which PMC operates?

P. Chalabi: PMC has a dedicated team within the organization that I lead and is responsible for the identification of new markets, technologies, and products that will carry PMC into the future. We utilized a corporate foresights methodology to identify the key trends and factors that will impact our business. Sustainability will be one of the key drivers for our innovation efforts. My group works closely with R&D as well as the broader Umicore community to ensure that the programs we work on are successfully achieved.

How did your latest technology additions of the Grubbs and MeNAP catalysts, respectively, complement your tool box, and where are these technologies used?

P. Chalabi: The acquisition of the Grubbs catalyst portfolio from Materia in 2018 was a significant step forward for our homogeneous catalyst business.



"Sustainability will be one of the key drivers for our innovation efforts."

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Umicore is recognized worldwide as the leader in metathesis catalyst technology. We have the most comprehensive portfolio of Grubbs catalysts available on the market today. In 2024, we are launching a series of new homogeneous catalysts starting with our MeNAP cross-coupling product line. The standout feature of MeNAP lies in its ability to execute challenging cross-coupling reactions such as Suzuki-Miyaura couplings of arylchlorids and boronic acid derivatives forming tetra-ortho-substituted biaryls at room temperature with low catalyst loadings. Both Grubbs catalysts and the new MeNAP catalysts can be used in pharma, fine chemical, and specialty chemical applications.

> "Umicore is one of the original companies in the precious metal catalyst world."

Precious Metals Chemistry means that you are handling costly elements and materials. How important is recycling, what is your approach to close materials loops and how do you manage it?

P. Chalabi: Umicore is one of the original companies in the precious metal catalyst world and has adopted long-standing procedures for the recovery and refining of precious metal-containing materials and waste streams. We are the largest refiner of precious metals worldwide. Our full-loop concept means that we work with our customers every step of the way from precious metal acquisition through conversion to precious metal-containing catalysts and then support the return of the precious metal-containing waste streams to Umicore for processing and generation of precious metal ready for new production. This full-loop concept is currently utilized by many of our customers.

Umicore works closely with customers in the research, development, and commercial manufacturing of complex organometallic chemicals and catalysts. Can you give some examples of these cooperations?

P. Chalabi: We are a big believer that customer-driven innovation is a key to success. Many of our most important products of today started as early-stage requests from specific customers looking for a technology that was not commercially available. Our advanced technology team within our R&D organization works closely with the R&D groups of our customers to design new catalysts that will give our customers a strategic advantage for their new product. We welcome these opportunities!

Where do you have technical centers and how do they support joint development projects with customers?

P. Chalabi: Our main technical center is in Hanau, Germany, but we also have R&D support in North America. All of our joint customer projects are assigned a project team consisting of both technical experts and commercial representatives under the lead of a project team manager. This setup ensures that communication flows efficiently and customer milestones are achieved.

Umicore commits to open innovation and collaborates with research institutes, start-ups and universities worldwide. Can you give some examples of partners and successes?

P. Chalabi: We utilize an extensive range of partnerships worldwide including academic collaborations, governmental organizations, and industrial partners. These partnerships can either be the acquisition of new IP, participation in open-innovation programs or can be development collaborations that extend our internal R&D resources to accelerate product development. Each of these types of partnerships are critical to the success of a multi-national company such as Umicore.

Umicore wants to inspire young talent with the program 'Imagine what you could do'. What is this program about?

P. Chalabi: Umicore has been quite active in sponsoring students through our Young Talents program. There are both technical and business tracks that expose students to the inner-workings of a major company. Many of the interns end up working for Umicore in the future. Not only does the student get insight into how a company like Umicore works, but we get great value from their insights and excitement. It is truly a win-win!

■ www.umicore.com

Life Sciences Industry Accelerates Growth

The top management of life sciences companies is very optimistic about 2024 and 2025, with over 80% of pharmaceutical, medical technology and biotechnology executives expecting profit growth for the current year and over 90% for the coming year. Around one in two companies expect profits to rise by more than 5% this year and 70% next year. These are the findings of the annual survey "Life Sciences Executives Flash Report" by consulting company Horváth (see also article on pp. 20-21).

For this study, Horváth surveyed executives from all over the world who work in companies in the life sciences industry in the first quarter of 2024.

The reason for the positive mood: those responsible firmly believe that volume growth (over 75%), new product launches (over 80%) and cost efficiency measures are having an impact. In particular, they are focusing on a leaner administrative structure. Almost 50% of respondents see this as an opportunity to increase profits, the report states. Another popular measure is the renegotiation of supplier contracts. Around 40% see an opportunity here. Further efficiency potential lies in the widespread energy-saving programs. Almost 60% of those surveyed are already implementing these; a further 25% have already decided on corresponding measures.

According to the results of the survey, managers currently see regulation as the biggest challenge for their companies. 90% expect the authorities to intervene more in the market. This is 25 percentage points more than in the previous year. A further 80% believe that the introduction of digital innovations will revolutionize the market and business models. In addition, a similar number of respondents expect a strong impact from reduced healthcare budgets due to public austerity measures. Two out of three companies are preparing for further challenges in their global supply chains.

■ www.horvath-partners.com

Sustainability from the Beginning

How Statistical Thinking Can Bring Chemical Research into the Environmental Age

Since the urgent crisis of global warming took center stage in the public eye, chemical manufacturing processes have borne substantial blame. This argument holds water: for instance, the Haber-Bosch process — which produces ammonia and supports the food needs of half the world's population — contributes a full 1.4% to yearly carbon emissions and eats up 1% of global annual energy.

There is clearly a need for reform in chemistry, and the space to do so. Additionally, the chemical production sector is already the third-largest emitter of CO_2 in the world, with its impact expected to further swell over the next decade. But often flying under the radar in climate conversations is the research taking place at benches in industry and academia. Environmental reform can come at massive scale, certainly. But beginning at the benchtop is much more practical for setting a precedent.

Sustainability in the chemistry lab must be a set of actions, not just an idea, and beginning with a sustainable end in mind could prove transformative in the fight against climate change. This action-centric paradigm is increasingly prevalent at industry conferences, such as the JMP Discovery Summit Europe in Manchester, UK. The idea that statistics can address urgent sustainability concerns at the lab bench was central to presentations from groups including Moderna, Boehringer Ingelheim, and ORF Genetics.

This work will explore the metrics by which chemists can make their experiments greener, then move towards academic and industrial examples of green chemistry, before finally discussing how statistical methods and computational chemistry can lead chemical formulation and synthesis towards environmental friendliness.

Approaching Green Science in the 21st Century

The twelve criteria for green chemistry were described by American chemists Paul Anastas and John Warner in 1998. Some suggestions they laid out were obvious: minimizing waste, choosing friendlier solvents, and opting for reagents with renewable feedstocks (such as ethanol, produced from corn). However, some of their tips for greener science were more nuanced: maximizing the percentage of atoms in the reactants which remain present in the products (known as atom economy), minimizing the use of protecting and blocking groups, which add steps to synthetic paths, and maintaining materials efficiency in purification workups.

Anastas and Warner's criteria earned substantial acclaim, and the green chemistry approach has now been deployed in nearly every subdiscipline of the field, from analytical separations to organometallic synthesis. And, in 2015, the United Nations included the need for green chemistry in their list of 17 goals for a more sustainable future.

Advancements in chemistry which utilize these principals represent some of the most cutting-edge science currently taking place, and we need look no further than the 2022 Nobel Prize in chemistry for an example. Carolyn R. Bertozzi, Morten Meldal, and K. Barry Sharpless shared the 2022 award for their work in click chemistry, bcrafting a set of reactions which occur at room temperature, in air, and with 100% atomic efficiency. Studying reactions such as this one can help lay the groundwork for highly efficient and practical reactions in industry, and many leading research groups are pursing environmentally focused chemistry.

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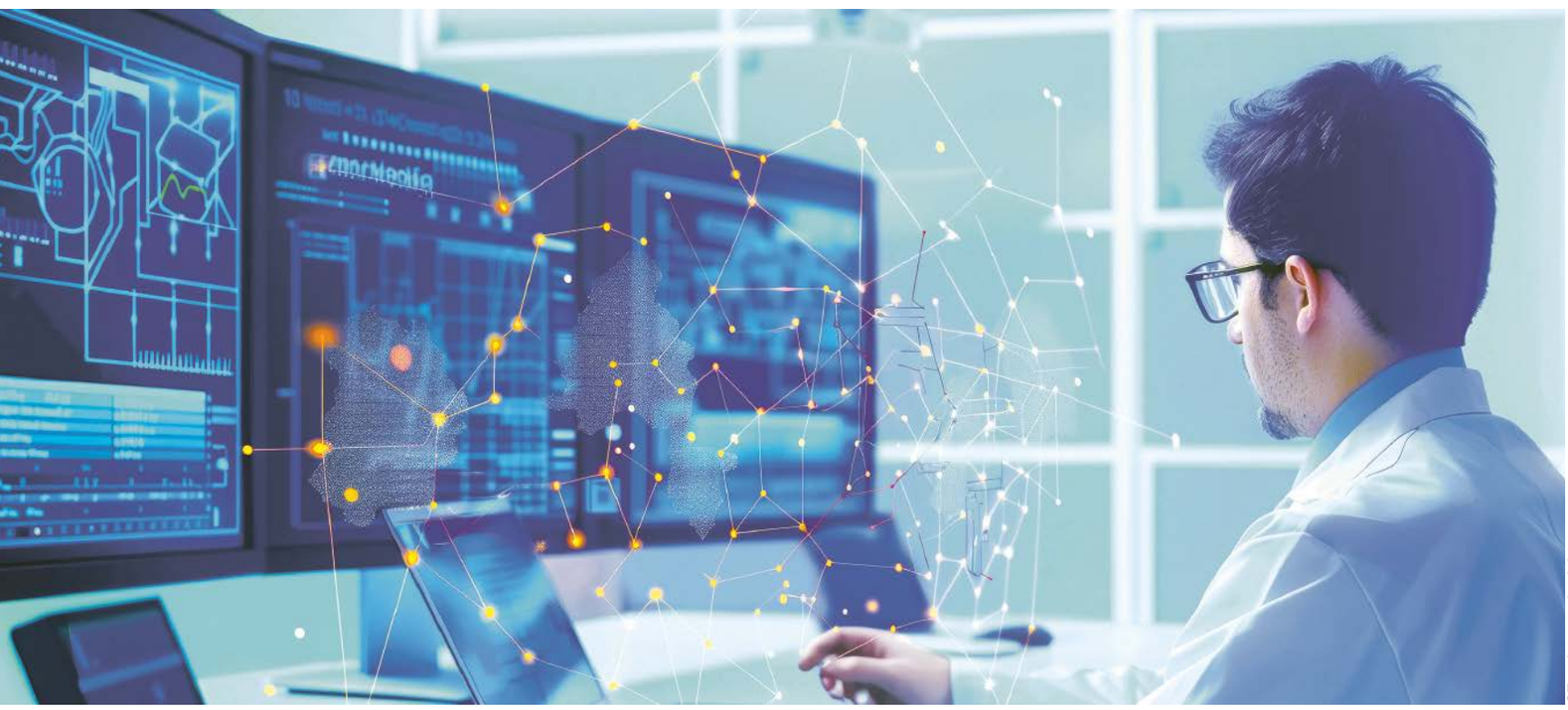
Jonathan (JR) Cobb, JMP Statistical Discovery

The Emergence of Green Chemistry at Scale

Chemists can and should optimize their benchtop operations for sustainability: each raindrop contributes to the flood, and each scientist can help in the fight against climate change. But the large-scale operation and mission of a com-



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pany also ought to be geared for environmentalism.

One such example is Icelandic plant biotechnology company and recombinant protein pioneer ORF Genetics. Their synthetic route to growth factors involves harnessing nature, not imitating it. Ásta María Einarsdóttir, research associate at ORF, notes that by using barley, they can create growth factors "on a very sustainable scale." Barley is recognized as a safe food substance and unlike many other growth factor production systems, it is endotoxin free. By using barley as a vessel to produce and store recombinant proteins, ORF Genetics can proceed without many of the hazards present in other growth factor synthesis schemes. Their work is an excellent example of beginning with a sustainable end in mind: barley seeds can be used not only as ideal production environments, but storage basins as well. Working towards an environmental goal and using clean methods to get there sets the stage for success in green chemistry.

"Sustainability in the chemistry lab must be a set of actions, not just an idea."

But chemists don't need to be alone in their work towards more sustainable reactions. This is not only the age of the environment, but also the computational age of data processing. The construction of digital reaction networks allows to bypass what Weber et al. describe as the "extract-make-use-dispose" scheme and move towards renewable feedstocks.

There needs to be a bridge between sustainable chemistry at the benchtop and meaningful change at industry scale, and digital chemistry could provide the link. Julia O'Neill, founder of Direxa Consulting and former distinguished fellow at Moderna, says that "statistical methods and Design of Experiments (DOE) are essential to accelerating progress, especially products that are really needed." Specifically, O'Neill says that employing statistical methods can improve timescales not just for R&D but also for scale-up, manufacture, and commercialization. Moreover, methods such as DOE can help build product data libraries and allow for quicker translational work, like Moderna did to iterate its Spikevax Covid-19 vaccine in response to emerging variants of the virus.

A New, Statistical Era of Formulation and Synthesis

Statistically designed experiments are perfectly suited to the formulation realm, where multiple variables must be considered to produce an ideal product. One thing that O'Neill acknowledges is that there is natural hesitance about including statistics in this setting. "I think some of the perception that Design of Experiments can slow work down is just people thinking that there's an artificial impact to follow search," she says. Because while "some level of base training [in DOE] is essential," O'Neill continues, software like JMP "allows the experimenter to block out the nuisance sources of variation, get results in an all-in-one kind of study, and get a clear picture of cause and effect by the end." The power of a statistically designed experiment to simultaneously test several variables allows for deeper understanding of more variables, all with fewer materials and less time invested.

Consumer products manufacturers have seen this win-win paradigm and realized statistical thinking's potential in formulation. Now, companies such as Procter & Gamble are using statistical methods like DOE to usher in a new era of formulation, allowing for more complex mixtures and preparations than ever before. Old procedures and ways of thinking cannot push towards new sustainability goals, and embracing a digital-first mindset will facilitate cleaner exploration and development, right from the start.

"The potential of statistical thinking in chemical synthesis is starting to be recognized."

DOE has long had utility in chemical formulation and production, and for good reason. But the potential of statistical thinking in chemical synthesis is also starting to be recognized. Ignacio Aliagas et al. warn that the impact of drug development must be considered, responsible for hundreds of thousands of kilograms of waste through the benchtop and clinical phases. This is where DOE can help again: the technique can be used to measure multiple variable impacts in formulation schemes, but it can also be used to predict the efficacy of molecules for therapeutic use. This slims the pool of drug candidates, and, coupled with computationally-optimized synthetic routes, can provide a twofold environmental advantage. As Einarsdóttir continues, "being able to use statistics allows you to solve much more complex problems than you could before," opening near-limitless medical research possibilities.

One place where this kind of research takes place is the University of Miami Miller School of Medicine, where researchers use machine learning and modeling to predict potential drug scaffolds for cancer treatment, eliminating the need for wasteful trial-and-error syntheses in the laboratory. Then, these scaffolds are tuned via predictive modeling in silico to produce pre-clinical leads. Sarfaraz K. Niazi et al. note that this process, known as computer-aided drug design, can "result in drug synthesis processes that are both efficient and environmentally benign," providing an excellent example of beginning with a sustainable end in mind.

Conclusion

In Stephen Covey's world-renowned book 'The Seven Habits of Highly Effective People', habit number two is to begin with the end in mind. And for chemists to be effective in the environmental age, we must begin with the end in mind as well. From simply swapping a more toxic solvent for a tamer one, to changing the entire way that we produce growth factors and discover drugs, the thought processes behind sustainability in chemistry must run from beginning to end. Only by employing the principals of green chemistry at every step can chemists push back against climate change.

References to this article can be requested from the author.

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Productivity in Biopharma Research Picks Up

Latest Trends in Pharma R&D – Improvement in Clinical Productivity and Drug Launches

Technological developments in the pharmaceutical and biotech industry are reflected in increased funding, higher R&D productivity and more product launches. However, the general conditions remain challenging. Incremental change won't be enough to deliver the results that the market and patients demand, warn industry experts. Real change will be paramount to achieving meaningful growth in the short and long term.

Artificial intelligence (AI) is not only penetrating our daily lives more and more, but is also increasingly changing the research and development of new active ingredients in the pharmaceutical industry. Scientists at the University of California (UC) San Diego have recently developed a machine learning algorithm that simulates the time-consuming chemistry involved in the initial stages of drug discovery. This could significantly streamline the process and open doors for never-before-seen treatments. While identifying drug candidates typically requires thousands of individual experiments, the new AI platform called Polygon could potentially deliver the same results in a fraction of the time, according to a report in „Nature Communications". The researchers used the new tool to synthesize 32 new drug candidates for cancer.

"A few years ago, AI was a dirty word in the pharmaceutical industry, but now the trend is definitely the opposite, with biotech start-ups finding it difficult to raise funds without addressing AI in their business plan," said senior author Trey Ideker, professor in the Department of Medicine at UC San Diego School of Medicine and adjunct professor of bioengineering and computer science at the UC San Diego Jacobs School of Engineering.

IQVIA: Global Biopharma R&D Productivity Rebounded

Technological developments in the pharmaceutical and biotech industry are also reflected in increasing R&D productivity. As the IQVIA Institute for Human Data Science reports, global biopharma R&D productivity rebounded in 2023 with higher composite success rates enabled by industry-wide and regulator adoption of data and technology driven innovation. This included novel trial design, optimized biomarker use, and digital and decentralized trial methodologies. This rebound occurred while clinical trial starts and funding returned to pre-pandemic levels, according to the IQVIA report "Global Trends in R&D 2024: Activity, Productivity, and Enablers."

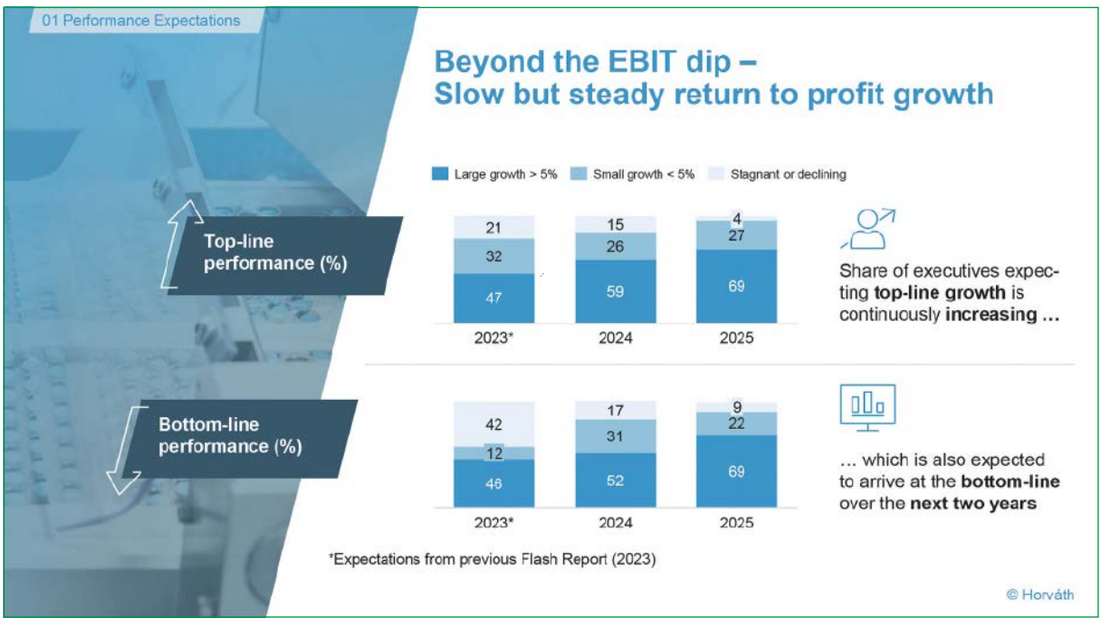
"The improvement in clinical productivity and composite success was notable across all therapy areas, particularly in Phases I and III and in regulatory review," said Murray Aitken, executive director of the IQVIA Institute for Human Data Science. "This reflects industrywide ingenuity and regulatory acceptance of innovative data and technology-driven enablers in trial design and digital trial execution. Clinical trial starts have returned to prepandemic levels, signaling a recognizable shift in pipelines and clinical development programs to a focus on innovative modalities in oncology, immunology, neurology and metabolic diseases."

> *"Seeing how this concept plays out over the next decade, both in academia and in the private sector, is going to be very exciting … The possibilities are virtually endless."*
>
> TTrey Ideker, professor, University of California San Diego

It is noteworthy in this context that the regulatory authorities also contribute to the higher output of biopharma. IQVIA points out, that regulatory agencies are generally attempting to make changes which the industry finds positive, including greater simplification, transparency and speed. However, the company notes that the pace of change differs across geographies.

In total, 69 novel active substances (NASs) were launched globally in 2023 —six more than the prior year—and representing a return to pre-Covid-19 levels. Also global funding of biopharmaceutical research and development increased to $72 billion, up from $61 billion in 2022. In the same period, M&A activity jumped to $140 billion from $78 billion in 2022, while the median deal value fell for the second year in a row, according to the report.

In contrast, the number of clinical test series starts declined 15% in 2023 from 2022, a third of which was driven by a reduction in Covid-19 trials. On the other hand, this decline also



reflected a shift in clinical development programs among large biopharma companies away from immunooncology to a focus on hot spots, including cell and gene therapies, antibody-drug conjugates (ADCs), multi-specific antibodies and obesity treatments.

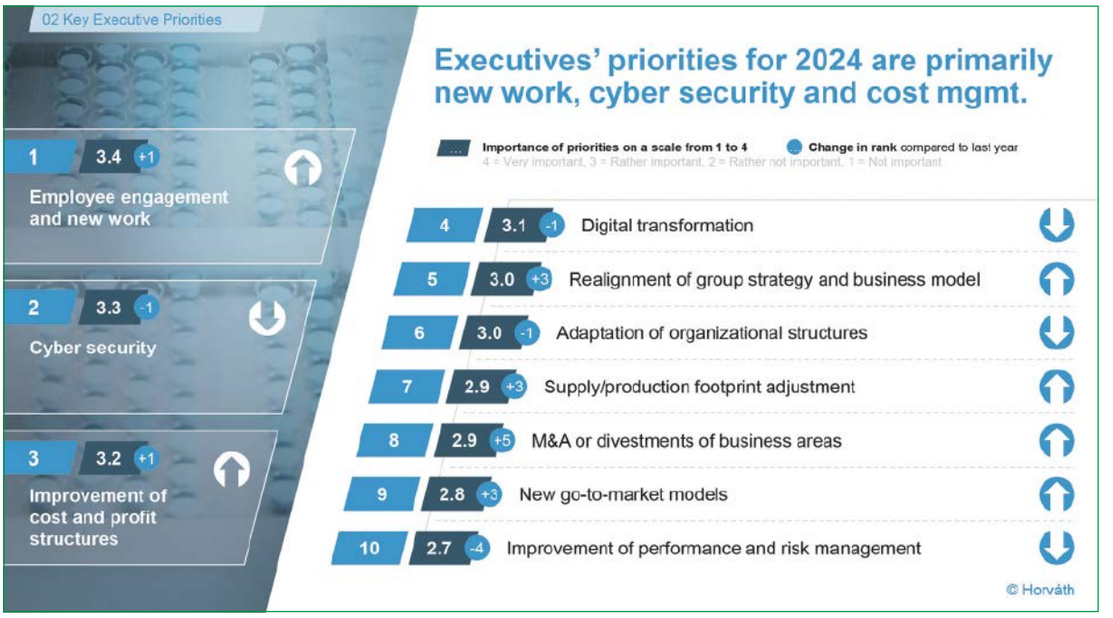
PwC: Risk from Geopolitical Tension

The consultancy firm PwC describes the situation for the biopharmaceutical industry also positive in many respects, although not always sunny: „A healthy pharma sector produces positive outcomes for both patients and investors. Over the last year, we've seen breakthroughs in vaccine development, cancer treatments, GLP-1 drugs that are revolutionizing obesity management, gene therapy and gene editing technology for rare diseases and new treatments for complex diseases like Alzheimer's," says PwC.

The challenge: Every cost on the P&L is going up due to inflation, interest rates, new tax regimes and an increasing threat environment, argues the firm. As the cost of doing business rises, prices for some of the most widely used drugs will be coming down with the implementation of the US Inflation Reduction Act which, for the first time, will allow the federal health insurance program Medicare to negotiate drug prices. Furthermore, the 2024 operating environment also faces continued risk from geopolitical tension, domestic political uncertainty and heated campaign rhetoric.

AI Training with More than One Million Molecules

Such adversities need not concern the scientists at UC San Diego. They can concentrate solely on the AI technology. Lead author Ideker points out that the few drugs with multiple points of action in the past were largely discovered by chance. Moreover, their development takes many years and costs millions of dollars. The new Polygon technology platform could help remove chance from the equation and launch a new generation of precision medicine. The researchers trained Polygon with a database of over a million known bioactive molecules, containing detailed information about their chemical properties and known interactions with protein targets.



Biopharma Managers Optimistic about the Future

In view of such technological developments, biopharma managers seem to be mostly optimistic about the future. According to a recent survey by management consultants Horváth Life Sciences, top management of life sciences companies is very confident about 2024 and 2025. Over 80% of pharmaceutical, medical technology and biotechnology executives expect profit growth for the current year and over 90% for the coming year. Around one in two companies expects profits to rise by more than 5% this year and 70% next year. Major reasons for the more optimistic picture are the expected effects from cost efficiency measures targeting mainly G&A and direct procurement, explains Horváth in its "Life Sciences Executives Flash Report".

PwC points out that leading companies can seize this moment to "reinvent for returns" in order to outperform in this environment. Companies with foresight will see 2024 as the year of delivering impressive results for both patients and investors. They will set their transformation agenda accordingly, which means rethinking the balance of R&D investments to increase focus on "white space," accelerating products through the value chain with transformative investments in AI, lowering operational costs across the enterprise and using deals as a key enabler of strategy.

> *"This reflects industrywide ingenuity and regulatory acceptance of innovative data and technology-driven enablers in trial design and digital trial execution."*
>
> Murray Aitken, executive director of the IQVIA Institute for Human Data Science

This is precisely the approach that the scientists from San Diego are pursuing with their new AI platform. Ideker: "Seeing how this concept plays out over the next decade, both in academia and in the private sector, is going to be very exciting … The possibilities are virtually endless."

Thorsten Schüller, CHEManager

Sustainable Practices in Biopharmaceuticals

BioPhorum's Influence on Industry-wide Green Initiatives to Support Eco-Friendly Biomanufacturing

BioPhorum, an industry collaboration group, focuses on advancing sustainability within the biopharmaceutical sector. In an exclusive interview, Nicola Coles, Director of BioPhorum Sustainability, shares insights into the organization's commitment to environmentally responsible practices. Coles, who has led BioPhorum's sustainability initiatives since 2021, discusses their strategic vision, achievements, and challenges with Christene Smith from CHEManager. From carbon footprint reduction to innovative plastic waste management, BioPhorum aims to shape a more sustainable future for the biopharma industry.

CHEManager: Mrs. Coles, could you provide an overview of BioPhorum's mission and impact on the biopharmaceutical industry? How does BioPhorum facilitate knowledge sharing, best practices, and industry progress?

Nicola Coles: BioPhorum's mission is to create environments where the global biopharmaceutical and device industry can collaborate and accelerate its rate of progress, for the benefit of all.

Since its inception in 2004, BioPhorum has become the open and trusted environment where senior leaders of the biopharmaceutical industry come together to openly share and discuss the emerging trends and challenges facing their industry.

Growing from an end-user group in 2008, BioPhorum's membership now comprises top leaders and subject matter experts from global biopharmaceutical manufacturers and suppliers, working in both long-established and new phorums. They articulate the industry's technology roadmap, define the supply partner practices of the future, and develop and adopt best practices in drug substance, fill finish, process development and manufacturing IT.

In each of these phorums, BioPhorum facilitators bring leaders together to create future visions, mobilize teams of experts on the opportunities, create partnerships that enable change and provide the quickest route to implementation, so that the industry shares, learns and builds the best solutions together.

From a sustainability perspective specifically in 2022 we developed a roadmap for the industry. This sets out our vision to "improve patient health by providing biopharmaceuticals while respecting the planet and responsibly using its resources". This vision was originally driven by three central goals:

- 1. To improve transparency of environmental impact
- 2. Decarbonize to net-zero across the value chain
- 3. Embed circularity across the product lifecycle

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Nicola Coles, BioPhorum Sustainability

During 2024 we have been discussing the need to update these goals to include nature and biodiversity in recognition of the growing crisis in this area, and in recognition of emerging frameworks such as the Science Based Target for Nature and the Taskforce for Nature Disclosure.

We will also be building out a maturity model this year across these four goals and across the product lifecycle, from raw materials-manufacturing-distribution-product use and end of life.

Can you share some of the key sustainability initiatives currently underway at BioPhorum?

N. Coles: A key focus for us is emissions as you would expect. We are targeting all scopes through HVAC Optimization and Decarbonization of water and are also working to understand our industry scope 3 hotspots. Alongside this improvement work we are working on transparency of environmental impact across the value chain—looking at supplies into the biomanufacturing space and supporting efforts to understand the impact of a biopharmaceutical product in totality.

> *"No one organization can do this alone, no one collaboration can do this alone. Connecting procurement, technical operations and regulatory voices to drive industry progress is essential if we are to hit the ambitious targets we have set ourselves."*

We have a strong plastics program, looking at opportunities for learning and innovation in both the plastics we use at the manufacturing phase—single use technology systems, and the plastics which enable product use through devices—autoinjectors, pens etc. During this year we will broaden our focus from plastics to consider wider material stewardship as we start to develop an approach to circularity and really understand what this means across the product lifecycle.

Biopharmaceuticals require access to significant volumes of high quality water, so we also have work in this area—beginning with water stewardship where we have recently published a paper, and moving to look at better water management though circularity and decarbonization.

How has the spirit of collaboration within BioPhorum led to breakthroughs in environmental responsibility?

N. Coles: BioPhorum has a long history of connecting suppliers and biomanufacturers to overcome technical challenges so when we began to look at environmental excellence we were already building off a strong foundation of trust and mutual respect. We are now using the voice of the patient/customer as articulated by the NHS to focus our work in this area. We recognize the NHS as the most ambitious health system we have seen to date in terms of supplier requirements and their work with the Sustainable Markets Initiative Health System Taskforces is galvanizing effort to improve transparency and reduce impact. We have leaned into other collaborations such as Together for Sustainability for the chemical sector to build off their experience and avoid duplication.

> *"… we are working on transparency of environmental impact across the value chain — looking at supplies into the biomanufacturing space and supporting efforts to understand the impact of a biopharmaceutical product in totality."*

Can you share a moment or achievement from your tenure since 2021 that you feel has significantly accelerated BioPhorum's progress towards its sustainability goals?

N. Coles: Our work on circularity is a key focus for me right now. This is an area where there is less clarity across the industry. Though there are pockets of innovation at specific points in the value chain—particularly at the devices end, few companies have a tangible strategy/vision for this area and very few if any are really measuring circularity. In my view there has been an over focus on recycling which is fraught with challenge—the infrastructure is not in place, there are many regulatory/quality challenges to consider at both a global and a local level and finally it's not clear with the data we have that recycling will contribute to reduced GHG emissions. In terms of the work we are doing—we are digging into the data—to understand our materials use, particularly for plastics where we see a growth in demand right across the product lifecycle. We are advocating for better LCA data so that we can be science lead in our decision making. We are connecting with organization such as the WBCSD , to learn from the work they are doing with other sectors on metrics for circularity. We are developing waste hierarchy guidance for the industry to drive better decision making. And in the meantime we are sharing best practice to enable all members to do the best they can with the technology they have available.

Can you provide an example of a project where BioPhorum's connections have led to responsible water stewardship?

N. Coles: We believe that there is a move towards stronger water regulation and recognize water stewardship as an important mindset shift the industry needs to mak —particular in the wake of extreme weather events. We have recently published a paper in this area which provides a case for water stewardship. The paper discusses the opportunities that effective water stewardship affords and some of the barriers organizations phase in terms of accessing funding for water projects based on perceived lower returns on investment. We held a joint webinar with PSCI and WWF on this topic and we will continue to track the industries progress in this area, developing solutions along the way.

> *"… we are digging into the data — to understand our materials use, particularly for plastics where we see a growth in demand right across the product lifecycle."*

What lessons can other organizations in the industry learn from BioPhorum's approach to sustainability?

N. Coles: I am often blown away by the generosity of individuals in the sustainability community to share, guide, support, champion and celebrate peers success. I have tried to take this spirit into my connections with other collaborations—to accelerate progress or amplify each other's messages. No one organization can do this alone, no one collaboration can do this alone. Connecting procurement, technical operations and regulatory voices to drive industry progress is essential if we are to hit the ambitious targets we have set ourselves and deliver our sectors central purpose to improve global health.

■ www.biophorum.com

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INNOVATION PITCH

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Programmed Cell Death
Development of Drug Candidates that Block Cellular Necrosis

Circular Battery Economy
Closing the Loop for Sustainable Battery Material Production

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Fighting Programmed Cell Death

Developing Drug Candidates Intended to Block Cellular Regulated Necrosis

SeaBeLife, a French biotechnology company, leverages its proprietary technology platform enabling the development and production of first-in-class drugs designed to block regulated necrosis (or regulated cell death). The substances target and treat acute pathologies with no effective treatments affecting vital organs such as the liver and kidneys. Morgane Rousselot, SeaBeLife's co-founder and CEO, talks about the company's innovative technology and plans to expand into other disease areas.

CHEManager: What does the name SeaBeLife mean?

Morgane Rousselot: In line with our motto 'From Sea to Life!' SeaBeLife is developing molecules that will improve the quality of life for patients with acute and severe pathologies. These are small molecules, capable of inhibiting regulated necrosis. Originally identified in the collections of the Station Biologique de Roscoff, some of them were bio-inspired by the marine environment. This is the fruit of the Laboratoire de Biologie Intégrative des Modèles Marins — LBI2M, UMR8227 — and the KISSf molecular screening facility's labor, focusing on the selection of chemical inhibitors of protein kinases.

What was the starting point and motivation for founding SeaBeLife?

M. Rousselot: The company was created from the research work of Stéphane Bach, a CNRS research engineer and scientific manager of the Roscoff KISSf screening platform, Marie-Thérèse Dimanche-Boitrel, research director at IRSET — the Institut de Recherche en Santé, Environnement et Travail – and Claire Delehouzé, SeaBeLife's scientific director and associate biotechnology engineer.

SeaBeLife's technology is based on a portfolio of over 150 biologically active, relevant molecules with the unique specificity of inhibiting two forms of regulated necrosis cell death activated in pathological conditions: necroptosis and ferroptosis.

The company was founded in 2019 and is presided over by CEO Morgane Rousselot, and Claire Delehouzé, with the entrepreneurial objective of accelerating development and advancing its pipeline.

What makes the company's technology so unique?

M. Rousselot: SeaBeLife's first-in-class small molecule is a dual inhibitor of regulated necrosis simultaneously targeting necroptosis and ferroptosis. In severe diseases, cells undergo regulated necrosis that vary between several forms, 'choosing' in the end the form with the least energy consumption while adapting to environmental signals. Recent research has shown that necroptosis and ferroptosis are two significant forms of regulated necrosis activated simultaneously or alternatively within tissues during diseases, initiating a detrimental cascade leading to organ destruction. Currently, there is no dual inhibitor of regulated necrosis on the market, providing SeaBeLife with a significant competitive advantage and a unique positioning.

How exactly can patients benefit from your pipeline drugs?

M. Rousselot: The goal of the therapeutic solution developed by SeaBeLife is to block cell death. Backed by in vivo tests and proofs of concept, its unique patented technology has already demonstrated its ability to protect organs, like liver, eye, kidneys, heart, brain, threatened by serious pathologies like severe hepatitis, dry AMD, etc. Several key steps remain before our candidates can reach patients, including clinical trials in humans.

Which therapeutic indications are you targeting with your products?

M. Rousselot: Our portfolio consists of two distinct assets currently under development, focusing initially on chronic pathologies – acute and orphan diseases – to mitigate development risks.

SBL01 is developed to treat acute liver diseases; severe and life-threatening conditions necessitating intensive care unit hospitalization, with a fatality rate of 30%. This provides an opportunity to rapidly demonstrate the effectiveness of our dual approach in the clinic in the context of an acute and orphan disease.

SBL03 targets geographic atrophy, the severe form of dry age-related macular degeneration, the leading cause of blindness in people over 50, affecting over five million patients globally. This is our first program to address high-prevalence chronic indications and represents a substantial market opportunity.

In the long term, through our development strategy, we aim to turn our focus to neurodegenerative diseases.

What will be the next key steps in the development of the company?

M. Rousselot: As of 2024, the applications for our molecules are protected by six patent families, with our most advanced candidates targeting liver and eye pathologies.

SeaBeLife is currently raising a Series A round to finance the completion of:

- SBL01's regulatory development, which includes the Phase 1 study with safety and preliminary efficacy data in humans by 2026
- SBL03's preclinical and regulatory development up to the submission of IND, by the end of 2025
- Subject to financing, the first human clinical trials for our drug candidates may begin as soon as 2025.

What do you see as the main drivers for your success and what is the feedback from the industry?

M. Rousselot: I see our key success drivers as being our innovative approach, our commitment to scientific excellence and our ability to address unmet clinical needs by focusing on the development of cutting-edge therapies for severe diseases such as ALI/ALF and dry AMD.

The feedback we are receiving from industry and from public and private investors is very encouraging. We have been praised and rewarded for our multi-targeted approach. KOLs recognize the transformative potential of this approach in the treatment of serious diseases for which effective therapeutic options are currently limited.

We are also encouraged by the growing support and interest from potential industrial partners, reflecting confidence in our vision and ability to deliver innovative solutions to the most pressing medical challenges. I am convinced that industry recognizes the potential of our approach to make a real difference to patients' lives.

© SeaBeLife

Morgane Rousselot, co-founder and CEO, SeaBeLife

Personal Profile

As co-founder and CEO since 2019, and boasting a strong scientific background, including a PhD in biochemistry and a degree in chemical engineering, **Morgane Rousselot** brings to SeaBeLife over 20 years of entrepreneurial experience in biotechnology. Her career is marked by numerous publications and patents while her passion for entrepreneurship has earned her multiple awards. Her career reflects her commitment to scientific research, innovation and leadership in the search for innovative healthcare solutions.

Business Idea

Saving Lives from Within by Protecting Cells

SeaBeLife's business model is based on licensing agreements or strategic co-development & marketing agreements with pharmaceutical companies, by candidate and potentially by indication. As part of this strategy, SeaBeLife will develop and take its candidates from proprietary programs through to preclinical or clinical phase 1, 2 or 3, and then enter into agreements with pharmaceutical companies who will take charge of the candidate's further development (clinical development, regulatory affairs, marketing). SeaBeLife will have the opportunity to evaluate in-licensing or co-development agreements at the time it deems most appropriate for each of its proprietary programs. These agreements will enable SeaBeLife to generate revenues based on upfronts, milestones and royalties.

The exit options will depend on SeaBeLife's future performance, its product pipeline, potential partnerships, and the evolving biotechnology and healthcare market. However, several options exist:

- Acquisition by a large pharmaceutical or biotechnology company: SeaBeLife could attract the attention of major players in the pharmaceutical or biotechnology industry, who may be interested in acquiring the company for its promising pipeline and innovative technologies.
- Strategic partnership: SeaBeLife could enter into strategic partnerships with established pharmaceutical or biotechnology companies, providing investors with the opportunity to realize profits through licensing, co-development or commercialization agreements.
- Acquisition by an investment fund: A life sciences-focused investment fund may consider acquiring SeaBeLife, offering investors an exit through a buyout transaction.
- Initial Public Offering (IPO): Going public could be an attractive option for SeaBeLife, providing investors with the opportunity to exit their investments while allowing the company to raise additional funds to finance its research and development activities and expansion.

- SeaBeLife Biotech, Roscoff, France
- www.seabelife.com

SeaBeLife
SEA INSPIRED & LIFE ORIENTED
BIOTECH

Elevator Pitch

Preclinical Development

SeaBeLife develops first-in-class drugs to block cellular necrosis, protecting and regenerating major organs affected by severe pathologies. The French start-up pioneers a revolutionary therapeutic paradigm aimed at halving the medical burden, including mortality rates, of severe pathologies lacking effective treatments. Its strategy focuses on developing first-in-class drugs, rooted in a proprietary platform technology comprising of small molecules that halt cellular death and forestall organ failure. With a robust pipeline boasting 150 patented molecules exclusively licensed to SeaBeLife, its innovative approach targets critical medical needs. Currently, the company is advancing two assets through preclinical development: SBL01, designed to address life-threatening orphan and Acute Liver Injuries / Failures (ALI/ALF), and SBL03, aiming to preserve vision in Dry-AMD patients, globally a leading cause of blindness among the elderly. These initiatives promise to transform patient outcomes, addressing significant social, economic and healthcare challenges.

Milestones & Roadmap

- SeaBeLife has achieved compelling in vivo Proof of Concept (POC) in hepatotoxicity models with its lead compound SBL01. All IND-enabling studies are currently underway, with clinical development anticipated to start by early 2025, initiating Phase 1 trials on healthy volunteers. For the ALI/ALF program, clinical safety and preliminary efficacy data are projected for 2026.
- The second lead compound, SBL03, is in early preclinical development with promising in vivo POC results in Dry-AMD models. We have formulated a slow-release formulation for intravitreal administration and an ophthalmic gel for instillation, both currently undergoing in vivo investigation. Preclinical development will continue throughout 2024 and 2025, with clinical development slated to commence in 2026.

Awards

2019, 2021, 2023
- AAP Transfert de technologies from the Région Bretagne

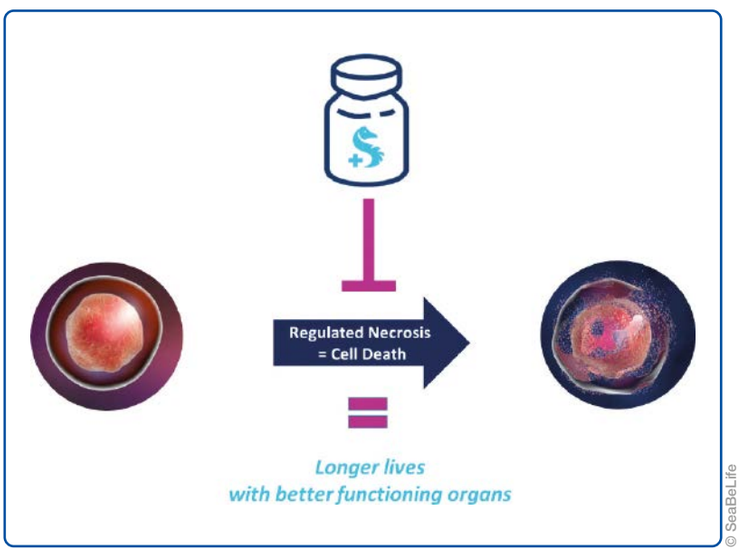
2021
- Aide à l'innovation DeepTech

2022
- Bourse French Tech Emergence grant, Concours i-Lab

2023
- WomenTech EU grant

© SeaBeLife

Co-founders (from left to right): Claire Delehouzé, chief technical officer; Morgane Rousselot, CEO; Stéphane Bach, IR-HC CNRS and inventor, Marie-Thérèse Dimanche Boitrel, INSERM and inventor



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SeaBeLife's technology platform enables the development and production of first-in-class drugs designed to block regulated necrosis (or regulated cell death) for the treatment of acute pathologies affecting vital organs.

A Circular Economy for Batteries

Green Li-ion Is Closing the Supply Chain Loop with Li-ion Battery Recycling Technology

While working in oil and gas, Leon Ferrant identified battery storage as a key challenge in the energy transition, which required upscaling recycling to satisfy demand. Partnering with Reza Katal, a battery recycling technology advancement expert, they recognized the battery recycling supply chain was unsustainable. A key step in the process, pCAM production, was mainly scaled in China. They envisioned a technological revolution that would make domestic pCAM production possible globally and founded Green Li-ion.

© Green Li-ion

Leon Farrant, co-founder and CEO, Green Li-ion

CHEManager: Mr. Farrant, what distinguishes your solution from those proposed by other battery recycling companies?

Leon Farrant: Precursor cathode active material (pCAM), a critical stage in battery manufacturing, involves processing black mass—shredded spent batteries comprised of a mix of impurities and critical minerals—from recycled batteries. Traditionally, this black mass must first be sorted into sulfates before being formulated into pCAM. Once produced, pCAM is converted into CAM, which can then be used for new batteries.

> „Green Li-ion's modular units are customizable to fit any battery cell producer's needs and deploy quickly into existing facilities."

Green Li-ion's Green-hydrorejuvenation technology streamlines this process, creating pCAM directly from black mass feedstock in under 12 hours.

Green Li-ion offers an affordable way for those with black mass to create more value and close the loop for domestic battery production. This gives them an option other than to send black mass to Asia for processing and refinement into battery-grade materials.

Whereas other battery recycling companies plan to build centralized plants where clients can send their black mass for recycling, Green Li-ion's modular units are customizable to fit any battery cell producer's needs and deploy quickly into existing facilities. They integrate seamlessly into existing production lines, unlike competitors who require the buildout of entirely new infrastructure.

Why is it important to have domestic battery recycling capabilities?

L. Farrant: Many of the countries where these critical minerals are sourced and mined have unstable governments and unpredictable political systems. Disruption of battery mineral supplies can result in supply problems and price spikes for important consumer goods like computers and cars. Batteries are made with many critical minerals, the most important being cobalt, lithium, and nickel. These three minerals were added to the US government's critical mineral list in 2022, with all three classified as having 'high supply risk' between 2025 and 2035.

Batteries are critical in the energy transition, but the current supply chain has potentially catastrophic pitfalls. A domestic supply chain utilizing battery recycling can boost bottom lines, reduce carbon footprints, and mitigate human rights concerns. Green Li-ion's recycling units will create a whole new market within the US and open new revenue streams for OEMs, diversified industrials using battery recycling as a business unit like the automotive industry, and pure-play recyclers.

What makes the company's recent Atoka installation unique?

L. Farrant: The Atoka installation is the first plant producing pCAM from black mass in North America, representing a giant leap forward for the battery recycling industry. Located within an existing recycling facility, the plant produces valuable battery-grade cathode and anode materials from concentrated components of spent batteries using Green Li-ion's patented multi-cathode-producing Green-hydrorejuvenation technology. The Atoka plant is expected to process two tons of black mass, or the equivalent of 72,000 smartphone batteries per day, with plans to quadruple this capacity within the coming year.

What hurdles must the industry and Green Li-ion overcome?

L. Farrant: Battery recycling is a nascent industry, and our technology's novelty poses significant challenges. Convincing customers and investors requires proof of concept, which is why we prioritize achieving operational milestones before seeking funding. In the US, for instance, we're waiting until our plant in Oklahoma produces high-quality pCAM graded by third parties before applying for federal grants. This strategy simplifies grant applications and reassures potential customers seeking grant eligibility.

Personal Profile

Leon Farrant, CEO and co-founder of Green Li-ion, brings two decades of global energy sector expertise. With a history of entrepreneurial spirit and vision, he has led established companies and start-ups across multiple continents to success. Leon excels at consensus-building and fostering diverse, high-performing teams aligned with social and environmentally conscious values.

Another hurdle lies in spent battery collection. Battery manufacturers rely primarily on virgin materials and lack efficient collection processes; OEMs or third parties implementing a robust collection system is crucial for cost reduction and risk mitigation.

Where is Green Li-ion headed next?

L. Farrant: Green Li-ion has already established a solid supply line and off-taker for the Atoka plant and is currently working to sign more deals to get our modular recycling units in more factories across the world. With the proven success of the Atoka installation, we aim to scale and deploy our modular technology worldwide, with a specific focus on North America and Europe for our next partnerships.

Business Idea

Ready-Made Recycling Units

The clean energy boom has led to a surge in global demand for lithium-ion batteries, creating a serious waste crisis. Despite being 95% recyclable, only 5% of these batteries are currently recycled worldwide, with the vast remainder ending up in landfills, posing environmental risks and leaving profit on the table.

Green Li-ion is working to create a commercially viable closed-loop battery recycling system, reducing reliance on virgin materials and landfill waste. This will not only create a more sustainable battery industry but also enhance the security of the supply chain for critical minerals needed in clean energy technologies.

Their patented Green-hydrorejuventation process, facilitated by their modular recycling units, runs black mass through special solutions to filter out impurities and reformulate the feedstock into pCAM. The process takes less than 12 hours and produces a product with 99% purity levels, ready to be dropped into new batteries.

Green Li-ion offers flexible options for manufacturers and recyclers to utilize its technology either through a licensing agreement that allows the plant to be installed in their own facilities or through a tolling agreement where they can send their black mass to Green Li-ion-owned plants for processing directly into battery materials. The modular nature of Green Li-ion systems allows for rapid deployment and setup that enables operations to begin in a few months instead of building dedicated infrastructure over several years.

Green Li-ion has already established a solid supply line and off-taker for the Atoka plant and is currently working to sign more deals to get their modular recycling units in more factories across the world.

The company is based in Singapore, with supporting teams in the US, South Korea, Germany, and Australia.

- Green Li-ion, Singapore
- www.greenli-ion.com

© Green Li-ion

Green Li-ion's Green-hydrorejuvenation technology enables the generation of precursor cathode active material (pCAM) directly from black mass feedstock in under 12 hours.

Elevator Pitch

Scaling Across the World

Green Li-ion has raised over 30M USD with partners including HSBC, Equinor Ventures, SOSV, EDP, Banpu NEXT, SK TES, Energy Revolution Ventures, TRIREC, and Petronas.
With the success of the Atoka installation, the first pCAM-producing plant in North America, the next step for the company will be scaling and incentivizing industry buy-in.

Milestones

2020
- Green Li-ion was founded
- Filing of the first family of patents
- Finalized R&D optimization on its breakthrough technology, GLMC-1

2021
- Continuing progress with its R&D, filing an additional patent family
- Start of work on new technologies GL LFP and GLMC-2
- Raised $3.5 million in seed funding round

2022
- Global strategic development team set up in the US, Europe and Asia
- Raised $12 million Series A funding

2023
- Filing of patents across eight families
- Construction of six working plants; first plant begins commissioning; remaining five plants ready to be shipped
- Setup of global R&D and engineering team in Australia and Singapore
- Raised $25 million Series pre-B funding
- Series pre-B extension round

2024
- Process for removing impurities in Li-ion batteries recycling patented
- LCA confirms that Green Li-ion's process reduces climate impact of pCAM production by nearly 90% compared to production using virgin materials
- Fully commissioned Atoka plant with the modular recycling unit successfully producing pCAM

Roadmap

2024
- Setup of first machines in Europe

2025
- Further scaling of technology to deploy GL TRAIN, with approx. 4x the capacity of current GLMC 1 unit
- Further refining GLMC 2 to allow for flexibility in producing either pCAM or metal salts and enable lower operating costs

© Green Li-ion

Green Li-ion's modular units are customizable to fit any battery cell producer's needs and deploy quickly into existing facilities. The plant at Atoka, OK, US, is the first producing pCAM from black mass in North America.

ChemOutsourcing 2024

ChemOutsourcing, to take place on September 3–6, 2024, in Parsippany, New Jersey/USA, attracts annually 700–800 experts from the pharmaceutical, biotech, chemical, and chemistry services industries. It focuses on API development spanning early drug discovery through chemical development and commercial supply. Attendees are executive scientist "buyers" from pharmaceutical companies responsible for sourcing starting materials, intermediates, active ingredients, and commercial supply.

■ www.chemoutsourcing.com

FECC Annual Congress 2024

The FECC Annual Congress will return to Sitges near Barcelona, Spain, on September 11–13, 2024. FECC, the European Association of Chemical Distributors, will once again organize a program with speakers from different sectors and backgrounds, combining all relevant facts and figures companies need to know with insights from experts and industry leaders. Additionally, networking opportunities along the entire chemical supply chain will extend the attendees' outreach towards existing and new peers.

■ www.fecc-congress.com

FEICA 2024 Conference and Expo

The 2024 FEICA European Adhesive & Sealant Conference and Expo is scheduled to take place in Noordwijkerhout, the Netherlands, on September 11–13, 2024. The event attracts 600+ industry leaders from all over the world to discuss market drivers and trends, innovation, sustainability and technological advancements. The FEICA Conference and Expo provides insights into the key issues affecting the adhesive and sealant industry and great networking opportunities for formulators, customers and suppliers.

■ www.feica-conferences.com

CPhI Milano 2024

CPhI Worldwide, taking place in Milan, Italy, on October 8–10, 2024, is dedicated to pharmaceutical developments, trends, products and services. Exhibitors include providers of contract research and synthesis services, suppliers of APIs, excipients, ingredients, intermediates and finished dosage forms, as well as producers of pharma manufacturing and packaging equipment. Additional online activities present even more possibilities to connect and do business with the pharma industry's most influential leaders.

■ www.cphi.com/europe

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