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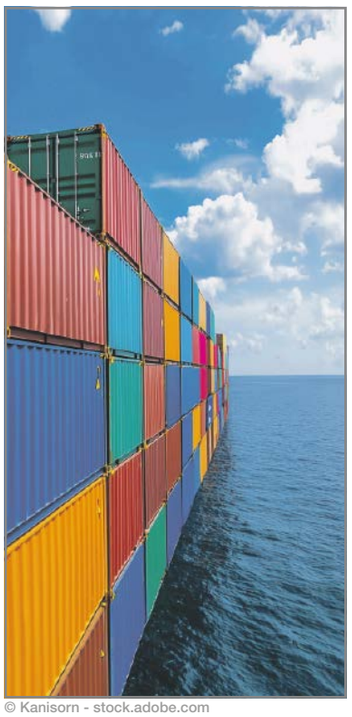
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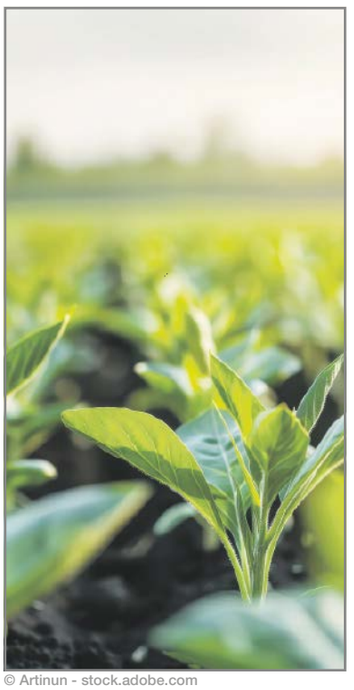
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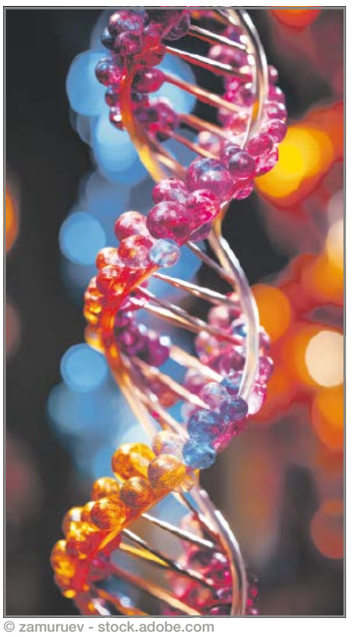
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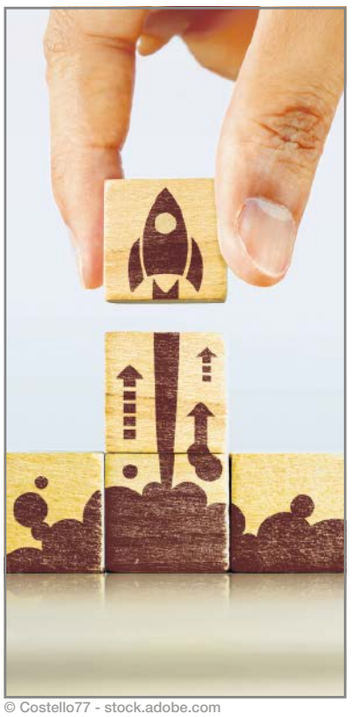
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Markets & Companies

Pharma & Biotech

Innovation

Specialty Chemicals in a Shifting World

Adapting to Tariffs and Strengthening Regional Networks

SOCMA, the Society of Chemical Manufacturers & Affiliates, is a leading trade association representing the specialty chemical industry. SOCMA prepares its members for future challenges and emphasizes the importance of regional supply networks in maintaining industry resilience. Jennifer Abril, President & CEO of SOCMA, has been instrumental in building networks among member companies and navigating industry challenges. In this interview, Christene Smith from CHEManager discusses with Jennifer the current geopolitical landscape, the impact of new tariffs, and SOCMA's strategies for fostering collaboration and innovation within the specialty chemical industry.

CHEManager: How are recent geopolitical changes impacting the specialty chemical industry?

Jennifer Abril: As a North American trade association, SOCMA represents a sector deeply rooted in regional manufacturing while operating within globally integrated supply chains. Geopolitical shifts—from trade tensions and tariffs to evolving national industrial policies—are prompting specialty chemical manufacturers to rethink how and where they operate.

These dynamics bring challenges, but they also open the door to new opportunities. SOCMA members often rely on globally sourced raw materials that aren't available at scale regionally. What distinguishes them is their ability to convert these inputs into high-value, performance chemistries that support critical sectors like pharmaceuticals, semiconductors, agriculture, and aerospace—both in North America and beyond.

While higher input costs are a growing concern, this is also a moment of strategic recalibration. Companies are investing in smarter, more resilient supply chains and building stronger regional networks. At SOCMA, we're focused on ensuring trade and regulatory policies reflect the interconnected nature of our industry, so our members can adapt, compete, and lead in an increasingly complex global environment.

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Jennifer Abril, SOCMA

Can you elaborate on SOCMA's strategy to navigate the challenges posed by new tariffs and protectionist policies?

J. Abril: SOCMA is advocating for a strategic, sector-specific approach to trade policy—one that reflects the realities of how specialty chemical manufacturers operate within global value chains. Our members typically import foundational raw materials—

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Geopolitical changes and new tariffs are impacting the specialty chemical industry.

often resource-intensive and unavailable at scale domestically—and transform them into specialized materials that fuel innovation across sectors such as pharmaceuticals, semiconductors, and construction.

We share the broader goal of strengthening manufacturing capabilities in the US, but that ambition must be paired with practical access to the global inputs that make innovation possible. That's why SOCMA is engaging directly with policymakers to ensure tariff structures are thoughtfully reviewed, and that appropriate exemptions remain available where domestic alternatives don't exist.

"Our aim is to help shape trade policies that bolster — not inadvertently constrain — the ability of specialty chemical producers to grow, invest, and compete on the global stage."

Our aim is to help shape trade policies that bolster—not inadvertently constrain—the ability of specialty chemical producers to grow, invest, and compete on the global stage.

What steps is SOCMA taking to help its members adapt to the changing regulatory environment?

J. Abril: SOCMA acts as a central resource for specialty chemical manufacturers navigating a dynamic and often complex regulatory landscape—from environmental rules and permitting to international trade requirements. We provide real-time policy updates, facilitate direct dialogue between members and regulators, and deliver practical guidance to help companies stay compliant while remaining competitive.

To deepen this support, we've launched a policy and tariff tracker on our website and hold weekly member calls to break down key developments and foster timely conversation. We've also introduced Navigating Volatility and Change: A SOCMA Pulse Poll Series—a set of quick, focused surveys capturing how companies are adapting their supply strategies, managing cost pressures, and responding to shifting customer demands. These insights help members benchmark in real time and stay agile in a fast-changing environment.

Can you discuss the importance of building regional supply networks in response to global supply chain disruptions? How is SOCMA fostering collaboration among its members to strengthen these regional networks?

J. Abril: The past few years have underscored the fragility of global supply chains and the need for more resilient, regionally anchored solutions. SOCMA is encouraging collaboration among members to strengthen domestic and North American sourcing, while also recognizing that international sourcing remains an essential part of the specialty chemical value chain.

Our members are not isolated operators—they're part of a broader ecosystem of innovation and production. SOCMA is fostering this ecosystem by building connections across companies, encouraging knowledge-sharing, and identifying strategic opportunities for collaboration. Through this networked approach, we're helping companies expand their supplier base, increase flexibility, and build greater resilience against geopolitical and economic disruptions.

How does SOCMA plan to support its members in leveraging new technologies and staying competitive in the evolving market?

J. Abril: SOCMA's Vision 2030 initiative sets a transformational goal: to elevate the role of specialty chemical manufacturing in North America as a strategic engine of innovation, economic resilience, and global competitiveness. We're committed to helping our members implement advanced practices

"Our members are not isolated operators — they're part of a broader ecosystem of innovation and production."

that improve efficiency, reduce environmental impact, and open new market opportunities.

This includes advocating for research and development (R&D) incentives, streamlining regulatory pathways for emerging approaches, and advancing workforce strategies that align with the industry's evolving needs. With the right policy environment and a continued focus on innovation, SOCMA members are well-positioned to lead the next era of chemical manufacturing—developing high-performance solutions that drive both economic growth and global progress.

How is SOCMA planning to engage with stakeholders to address the challenges and opportunities in the specialty chemical industry?

J. Abril: SOCMA is actively engaging with federal officials, legislators, and industry partners to ensure the specialty chemical sector is represented at every level of decision-making. We are advocating for a transparent, predictable trade policy that reflects both the global integration and domestic significance of our industry.

Our members are essential to the national industrial base—creating high-quality jobs, supporting downstream innovation, and contributing to long-term economic and technological leadership. As the Trump administration pursues a more self-sufficient trade agenda, SOCMA is committed

"We are advocating for a transparent, predictable trade policy that reflects both the global integration and domestic significance of our industry."

to serving as a constructive partner with the aim of shaping policies that strengthen North American manufacturing while safeguarding the global supply networks that enable innovation.

■ www.socma.org

From Listening to Action

Standing Strong for Europe's Chemical Industry

The European chemical industry is at a crossroads — it has been for a while now — and today, we've hit a momentum that we cannot afford to let slip by. The urgency is palpable, and the reality is stark across the sector: soaring energy costs, which account for 40% of the average cost base in the upstream part of our industry, coupled with tightening regulations, have plunged our industry into crisis. Over the past two years, the rate of closures for European chemical production sites has surged to 10 times the historical average. But it's also a moment of opportunity — if we act now.

So far, we've seen the European Commission's Competitiveness Compass outline a new approach to competition policy and the Clean Industrial Deal focus on Energy Intensive Industries and Clean Tech. But it's time we move from strategy to action. At the high-level strategic dialogue on 25 March, Ilham Kadri, CEFIC's President, delivered a powerful message: "For us, it is way past 12 o'clock." We've been saying it for a while now: Europe's chemical industry is in a race against time. Without bold, urgent action—particularly to address energy costs and regulatory burden—we risk losing an entire industrial base. And it's not just about the chemicals we produce—it's about Europe's future as a global economic powerhouse.

The message is clear: we need action, and we need it now. Based on recent initiatives like the Clean Industrial Deal, Competitiveness Compass and our conversations with Commission Executive Vice President Stéphane Séjourné and Commissioner Jessika Roswall, it's clear that our calls are being heard. But we need all levels of European decision and policy makers on board if we want to shift the current trajectory. We need support from each chemical association at the national level to make this happen.

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Marco Mensink, CEFIC

Geopolitical Challenges and the Need for Resilience

Building on Europe's structural competitiveness struggles, recent geopolitical shifts are significantly impacting the chemical industry, adding layers of complexity to an already volatile landscape. Particularly for an export-oriented sector like the European chemical industry, protectionist policies and rising tariffs pose a huge challenge as the industry has heavily benefited from global market integration. With some countries opting for sky-high trade barriers, it's clear that Europe is up against stiff competition.

CEFIC has been steadfast in its response, advocating to tackle unfair trade practices and market distortions that harm our industry by strategically making use of the EU's trade instruments. Concretely, we aim to expedite antidumping investigations to offer quicker relief to affected producers before they are forced to shut down.

At the same time, we must enhance efforts to diversify our non-EU supply sources to decrease dependencies and

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Europe's chemical industry faces regulatory changes and protectionist policies.

we need to capture more growth by tapping into new markets. To this end, we need to open and deepen access to third-country markets. We therefore ask EU policymakers to get ongoing FTAs like Mercosur, India and the ASEAN countries over the finishing line.

"We want to make sure that European companies are not bogged down by regulatory burdens but empowered to innovate and compete on the world stage."

But beyond just managing the risks of geopolitical change, we're positioning ourselves to emerge stronger by reinforcing Europe's strategic industries. Our recent calls for securing key chemicals for defense and critical medicine production are pivotal in making Europe more resilient. These efforts must be supported by decisive EU actions that not only protect our interests but also ensure that European chemicals continue to be a cornerstone of our economy.

Navigating Tariffs and Protectionism

As I speak today, protectionist policies and rising tariffs are some of the most pressing challenges confronting our industry. At CEFIC, our team is working tirelessly to mitigate these effects and help our members navigate these external pressures. What we need now is a sense of urgency, especially in the face of an escalating global trade war. We need to be especially mindful of increased competition due to the diversion of trade flows to the EU and other third markets.

However, it is also not all trade policy. As competitiveness starts at home, it is equally important to ensure that all our policies are backed by a strong industrial strategy that fosters growth, ensures access to affordable energy and feedstocks, enables innovation from lab to industrial scale, supports the development of markets that reward sustainable products, and attracts long-term investments within Europe. We need a proactive approach to shield our sector from protectionist trends and to create an environment where businesses can flourish.

Adapting to the Changing Regulatory Environment

The regulatory environment is evolving rapidly, and it's not just about staying compliant—it's about staying ahead. Sticking to the long-term direction of travel to provide the stability that business needs but adapting to the circumstances with pragmatism. At CEFIC, we've made it a priority to help our members not just navigate but adapt to the changes that are coming their way. Whether it's the complexity of REACh or the push for more circularity, we're working to simplify and streamline the regulatory framework so our companies can focus on innovation rather than paperwork.

Through our ongoing advocacy, we're striving for a true simplification of the REACh framework, which is essential for maintaining investment confidence in Europe while safeguarding our human and environmental protection standards. Moreover, we are also focused on ensuring that regulatory requirements become more predictable, so businesses can plan for the long term with confidence. We want to make sure that European companies are not bogged down by regulatory burdens but empowered to innovate and compete on the world stage.

Building Regional Supply Networks in Response to Disruptions

One of the most significant lessons of recent global disruptions has been the importance of strong, resilient supply chains. For Europe, building regional supply networks is no longer just a strategy; it's an imperative. Global supply chain disruptions have exposed vulnerabilities: we had a first alert at the time of Covid now it is even more pressing: we need to avoid overly relying one or two countries alone. We also need to build on the strength or our European single market.

CEFIC, Brussels, Belgium is at the forefront of fostering collaboration to strengthen these regional networks. By bringing together stakeholders from across Europe, we're working to ensure that the raw materials, chemicals, and technologies needed to drive Europe's industries are sourced from within our region, where possible. This not only ensures greater security of supply but also reduces dependencies where necessary, making Europe's industrial base more resilient to geopolitical shocks.

Moreover, by focusing on sustainable and circular supply chains, we can create value and reduce costs, all while meeting our climate goals. The need for collaboration across and within sectors—from chemicals to pharmaceuticals, from energy to construction—has never been more critical.

Leveraging Technology for Competitiveness

The future of the chemical industry lies in innovation, and Europe must remain a leader in this space. Not only to invent new technologies, but to develop them at industrial scale in the region. But to do so, we need to leverage new technologies and support our members in staying competitive. Whether it's through the digital transformation of our operations or through the development of next-generation sustainable chemicals, technology will be key to maintaining our edge. Public funding will be essential for scaling-up our inventions and fast permitting coupled with de-risked private investment should help exploit our innovations at industrial scale.

CEFIC is working hard to ensure that our members have the tools and support they need to innovate. One of the critical components of our 10-point rescue plan for chemicals is securing funding for research and development. The chemical industry cannot afford to fall behind in the race for new technologies, and we need the EU to provide the financial resources and the strategic vision to help us stay at the cutting edge.

"CEFIC's role is not just to advocate for the chemical industry but to create the conditions for collaboration and mutual support."

Through dedicated funds for R&D, as well as public-private partnerships, we can ensure that Europe continues to lead the way in sustainable, circular, and innovative chemical solutions. Access to EU funding requires a one stop-shop as well as faster and simpler procedures that also work for SMEs. These efforts will not only benefit the chemical industry but will also strengthen Europe's entire industrial ecosystem.

Engaging Stakeholders for a Stronger Future

CEFIC's role is not just to advocate for the chemical industry but to create the conditions for collaboration and mutual support. We're actively engaging with stakeholders—from policymakers to industry leaders and value chain partners—to ensure that the challenges and opportunities facing the specialty chemical sector are addressed head-on. Our ongoing dialogue with EU leaders is a testament to our commitment to ensuring that the voice of the chemical industry is heard loud and clear at the highest levels of government.

"Europe's chemical industry is in a race against time."

But our job doesn't stop there. It's about ensuring that these discussions translate into real, tangible actions that will create a sustainable, competitive future for Europe's chemical industry. The urgency of the moment demands that we all take action. The question is no longer "What can be done?"—it's "How soon can we do it?"

A Call to Action for Europe's Chemical Industry

I'll be honest: the road ahead is going to be tough. But I'm more confident than ever that if we act now, we can secure a bright future for Europe's chemical industry. We need our EU leaders at all levels to take bold, urgent action on the 10-point plan. We cannot wait any longer. We need to remember that if we fall, all the downstream industry sectors will pay the price.

Our industry representatives are standing on the wall and fighting for our sector every day. But we can't do it alone. Now is the time for all of us to rally together—to push for the policies that will safeguard our future and ensure that Europe remains a global leader in the chemical industry.

We're ready. Are you?

Marco Mensink,
Director General, CEFIC,
Brussels, Belgium

■ www.cefic.org

Resetting the UK-EU Relationship

A Path to Stabilizing the Chemical Supply Chain

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Brexit-related disruptions impact the UK chemical supply chain, emphasizing the importance of renewed UK-EU collaboration.

Critical to domestic and global industry, the UK chemical supply chain continues to experience Brexit-related disruptions. Tim Doggett, CEO of the Chemical Business Association (CBA), explains why relations with the EU are best rekindled.

A Barrage of Disruptions

In recent years, the chemical supply chain has faced disruption from all angles: the pandemic, the Russian-Ukrainian war, Red Sea shipping attacks, global inflation and more recently, trade tariffs. What's more compared to pre-pandemic years, UK chemical production has fallen by a quarter, with major reductions in exports.

Throughout this period, the EU—who's chemical industry revenues are second only to Asia—has remained a critical partner, transit route and market for the UK chemical industry, with annual exports to Europe of around £30 billion (€34.8 billion). Despite this, Brexit-related logistical and regulatory issues are disproportionately impacting chemical businesses on both sides of the border, particularly SMEs.

In the CBA's latest Brexit survey of members in November 2024, 71% faced chronic import/export challenges, while 82% were concerned by regulatory uncertainty. What's more, in practice, the combination of increased regulation and border checks has extended typical delivery timescales from three days to as much as two weeks and in some cases, they are even longer.

To mitigate the potential for bottlenecks and missed deadlines, some UK businesses are now holding around four weeks' worth of stock, compared to just one weeks' prior to Brexit. This increase, a precautionary necessity, has inflated warehousing costs, impacting company cash flows and investment in growth.

The shift from 'just in time' to something more akin to 'just in case' inventory models has also presented financial and logistical challenges. Businesses that have had to stockpile materials to mitigate delays are experiencing higher warehousing costs, which in turn are having an impact on cash flow and in some cases liquidity. With some companies unable to absorb the added costs and delays, they have opted to reduce or cease certain trade routes altogether or indeed move their operations to the EU.

© Chemical Business Association

Tim Doggett, Chemical Business Association (CBA)

Regulatory Challenges

A significant import/export issue for chemical companies trading between

the UK and EU is they now have to comply with both UK and EU regulations. Not only has this created a major administrative burden, but the costs of compliance have risen substantially. In some cases, only wages and capital investment are now costing more on the bottom line.

One of the biggest regulatory challenges is UK REACh. Before Brexit, the UK followed EU REACh regulations. It is estimated that over the years more than £500 million (€580.6 million) was spent on data to achieve compliance. Following Brexit however, EU REACh was replaced by UK REACh, a model that effectively requires the duplication of EU REACh data.

Not only are the costs of duplication which are estimated by the Department for Environment, Food & Rural Affairs (DEFRA) to be between £1 billion (€1.16 billion) and £3.5 billion (€4.06 billion) a significant impact on business, the regulation—and particularly ongoing uncertainty as to what the final model will look like—are a significant incumbrance and barrier to trade for UK businesses. Moreover, the impact of UK REACh goes beyond the chemical supply chain and the wider chemical industry, affecting users who had not previously been within the regulation's remit including downstream users who are now also affected.

"Brexit-related logistical and regulatory issues are disproportionately impacting chemical businesses on both sides of the border."

Despite ongoing lobbying by the CBA directly with the Government and government departments, since DEFRA announced it would explore an alternative model, and look at the deadlines in December 2021, progress on UK REACh has continued to be slow.

Although the deadlines have been extended, businesses still wait for clarification on an Alternative Transitional Registration model (ATRm). With work still in progress, the ongoing uncertainty on UK REACh means investment is curtailed, stifling trade, innovation, and growth in the UK chemical supply chain, the chemical sector and indeed the wider economy.

Ambiguity, coupled with widening regulatory divergence between the UK and the EU, has also made compliance more complex. Many businesses are

© Chemical Business Association

struggling to source critical materials, leading to supply chain inefficiencies and, in some cases, making certain chemicals commercially unviable. Without timely resolution, the lack of clarity will further hinder trade, innovation, and economic growth.

Beyond UK REACh, evolving EU regulations also continue to affect UK exporters. The recent updates to the EU's Classification, Labelling, and Packaging (CLP) and REACh regulations impose additional requirements, adding further compliance obligations for UK businesses trading with the EU.

Re-Establishing the EU Relationship

The UK Government's stated desire to reset its relationship with the EU clearly underscores a commitment to rebuilding and repairing ties with the bloc through closer alignment. And while exploratory talks and negotiations have been promising, the importance of the chemical supply chain on both sides and its enormous impact on everyday life means it is vital to resolve the issues and disruption caused by Brexit.

"Without timely resolution, the lack of clarity will further hinder trade, innovation, and economic growth."

The CBA remains a leading voice in advocating for meaningful progressive discussions with the EU. The chemical supply chain underpins a vast range of critical industries, from healthcare and energy to manufacturing and construction. Underlining the need for practical, clear workable solutions is clear and has never been more urgent.

The CBA is focused on securing regulatory clarity, easing trade friction, and fostering deeper collaboration with EU counterparts, all essential to restoring the sector's global competitiveness and enabling long-term sustainable growth.

"The CBA is focused on securing regulatory clarity, easing trade friction, and fostering deeper collaboration with EU counterparts, all essential to restoring the sector's global competitiveness and enabling long-term sustainable growth."

Compounding existing pressures, the recent announcement of broad reaching US tariffs has introduced additional confusion and disruption into already stretched global supply chains.

Whilst chemicals may not have been specifically targeted, such measures will inevitably have knock-on effects across many sectors, including the chemical supply chain, raising concerns and costs for downstream industries, dampening demand, and increasing uncertainty for manufacturers on both sides of the Atlantic.

For an industry reliant on complex, cross-border supply routes for raw materials and intermediates, the introduction of further trade barriers risks delaying shipments, inflating production costs, and eroding competitiveness.

Against this backdrop, there is renewed opportunity, and necessity, for the UK and the EU to collaborate more closely. Greater regulatory alignment and reduced trade friction will not only strengthen supply chain resilience but also reinforce the region's standing in an increasingly volatile global market.

What this may mean for many, is restoring some semblance of full market access, something which may well not be possible without re-negotiating current agreements or the UK rejoining the single market.

Tim Doggett, CEO, Chemical Business Association, Crewe, UK

■ www.chemical.org.uk

Sustainable Chemistry Meets Bioeconomy: A Perfect Match

How Sustainable Innovation Can Drive Inclusive Growth in Latin America and the Caribbean

Adrián Rodríguez is Chief of the Bioeconomy Unit at United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC). In September last year, he and Romina Laumann, Director of Strategic Alliances at the International Sustainable Chemistry Collaborative Centre (ISC3), visited Germany for a study trip on bioeconomy for regional development.

A Vision for Sustainable Growth

The compelling question of their trip was: Can sustainable chemistry and bioeconomy work hand in hand to promote long-term, inclusive growth in Latin America and the Caribbean (LAC)? They, along with Latin American representatives, investigated how bio-based industries powered by sustainable chemistry create new economic value. Visits to biorefineries and innovation centers during their study tours led to collaborations, joint publications, and a new key insight: sustainable chemistry and bioeconomy could be a perfect match, opening strong paths to sustainable regional development—for inclusive growth in LAC.

Biomass as a Resource: Chemistry's Transformative Role

Chemistry plays a key role in turning organic matter into valuable products. Technologies like enzymatic catalysis and fermentation allow industries to produce bioethanol, bioplastics, and specialty chemicals from agricultural residues, forestry byproducts, and even algae. What's more, innovations in chemical engineering are enabling more precise control over bioconversion processes, increasing yield and product quality. For instance, synthetic biology allows the design of microorganisms tailored to produce specific molecules. These developments offer huge potential for LAC economies to diversify exports and reduce dependence on fossil-based imports.

Biorefineries play a crucial role in this. They are at the heart of a circular bioeconomy because they integrate biochemical and thermochemical processes to convert biomass into a wide array of products and support industrial symbiosis by ensuring that one process's waste becomes another's input. In countries like Brazil, stakeholders are already developing such systems.

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Adrián Rodríguez, UN ECLAC

Romina Laumann, ISC3

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Bio-Based Doesn't Automatically Mean Sustainable

When visiting the model region of bioeconomy at the National Research Center Jülich, Rodríguez pointed to a pilot biorefinery in Ecuador that turns crop waste into clean fuel: "A byproduct once seen as waste can become a key economic driver." In the discussion with experts on site, Laumann emphasized that "bio-based doesn't automatically mean sustainable." If designed inefficiently, these processes can consume excessive energy or involve harmful chemicals. After the visit to the plant and the discussions on site, the group of Latin American officials saw lasting confirmation that sustainable chemistry ensures safer, smarter, and resource-efficient solutions.

Use of Agricultural Residues Offers Great Potential

These on-the-ground insights were further enriched by joint research initiatives that explored region-specific opportunities for bio-based innovation. One such area of growing interest is the use of agricultural residues—a resource with significant untapped value in LAC.

A study implemented in the framework of the German-UN ECLAC Strategic Cooperation explored the economic potential of using agricultural residues in four value chains. These projects revealed promising opportunities for value creation yet also highlighted risks. Some biofuel production can conflict with food security or biodiversity. Here, sustainable chemistry guides

decision-making to avoid such trade-offs. To further advance this field, policy support is vital. Investment in biorefinery infrastructure, streamlined regulatory processes, and financial incentives for startups can help scale innovations. Pilot programs in Argentina and Peru have shown that local communities, when involved early, become champions of bio-based transitions. The key lies in building public trust and ensuring benefits are distributed equitably.

"A byproduct once seen as waste can become a key economic driver."

Adrián Rodríguez,
UN ECLAC

Sustainable Chemistry Innovation in Latin America and the Caribbean: Toward Safer Materials

Back to the study trip: During an exchange round with regional development agencies in Leipzig, Rodríguez reported on a project in Uruguay that is a great example of how sustainable chemistry drives the development of biodegradable, recyclable materials. It explores packaging made from pine pulp and industrial hemp. "This is an eco-friendly alternative to plastics," said Rodríguez- "But making it scalable and competitive remains a challenge. Because on the one hand, chemistry helps optimize material properties and reduce production costs. On the other hand, success depends on thoughtful and benign design."

The principles of sustainable chemistry ensure that environmental benefits are not lost in pursuit of growth. There is also growing interest in integrating Life Cycle Assessment (LCA) into product development. LCA tools help researchers and companies evaluate environmental impacts, ensuring that innovations deliver genuine sustainability gains. This is especially relevant in LAC, where environmental degradation and social inequality often overlap. When paired with holistic evaluation tools, green chemistry becomes a lever for just transitions.

Strategic Capacities: Unlocking Regional Potential

After returning from the study trip to Germany, Rodríguez is even more convinced that bioeconomy is a key strategy for diversifying the LAC economy and creating local value. "Currently, bioeconomic value is concentrated in food and agriculture," he noted. "But with investment in knowledge and innovation, the Latin America and the Caribbean region can go further."

"Bio-based doesn't automatically mean sustainable."

Romina Laumann,
Director of Strategic Alliances, ISC3

LAC's vast biodiversity offers a rich foundation for bio-based industries. Brazil, for instance, used its G20 presidency to launch a global bioeconomy Initiative. The initiative promotes sustainable growth, conservation, and job creation. Meanwhile, national policies in Colombia and Brazil are starting to embed bioeconomy principles into their broader industrial strategies.

Moreover, academic institutions and innovation clusters play a pivotal role in capacity development. Universities in Chile and Costa Rica are already offering interdisciplinary programs in bioeconomy and green chemistry. Supporting these ecosystems through international cooperation can create a new generation of skilled professionals equipped to lead the region's sustainable transformation.

A Collaborative Path Forward

The study trip has impressively demonstrated the need for cross-regional collaboration, particularly Germany, has supported LAC through knowledge transfer, research, and green investment. Programs have played a vital role. But strengthening cooperation within LAC itself is equally important. It enhances supply chain resilience, supports local production, and spreads the benefits of innovation.

The ISC3 White Paper "Advanced Bioeconomy and Bioenergy: Strategies for Sustainable Development in Ecuador & Uruguay" offers guidance:

- Adopt "Safe and Sustainable by Design" principles
- Invest in education and local expertise
- Build inclusive policy frameworks

Sustainable chemistry and bioeconomy, together, hold the potential to lead LAC into a future of innovation-driven, sustainable prosperity.

Looking ahead, the establishment of regional platforms for dialogue and joint action will be essential. Whether through shared research hubs, intergovernmental working groups, or multi-stakeholder initiatives, a united approach will help LAC countries realize the full promise of a sustainable bioeconomy rooted in chemistry. In a world confronting climate crisis, resource scarcity, and inequality, the synergy between sustainable chemistry and bioeconomy stands out as both visionary and necessary.

"Currently, bioeconomic value is concentrated in food and agriculture, but with investment in knowledge and innovation, the Latin America and the Caribbean region can go further."

Adrián Rodríguez,
UN ECLAC

As Laumann put it with a wink: "'A Perfect Match.' And perhaps, a blueprint for the future."

Adrián Rodríguez, Chief of the Bioeconomy Unit, UN ECLAC, Romina Laumann, Director of Strategic Alliances, and Christian Ruth-Strauß, Director Communications, ISC3

■ www.isc3.org

The Bioeconomy

Opportunities for the Chemical Industry in Challenging Times

The European chemical industry is facing a decisive transformation. While dependence on fossil raw materials and linear value chains harbors increasing risks, the bioeconomy offers a promising perspective. It makes it possible to develop sustainable solutions that promote both economic growth and ecological stability. However, the current framework conditions are challenging consumers and companies are shifting sustainability goals, and political priorities are shifting away from green issues towards security issues. Nevertheless, the transition to a bio-based circular economy remains an essential step to ensure long-term economic prosperity and ecological stability.

The chemical industry plays a key role not only in realizing the EU's climate targets, but above all in securing value chains. The bioeconomy contributes to the resilience of the European economy, as bio-based raw materials such as agricultural residues or food waste offer alternatives to fossil resources. At the same time, innovative materials such as biodegradable packaging or technologies for recycling biological polymers create closed material cycles and minimize environmental risks. These approaches not only offer ecological advantages, but also economic opportunities: they help companies to position themselves for the future in an increasingly regulated market environment and secure competitive advantages.

But the challenges remain great. According to the World Economic Forum's latest Global Risk Report 2025, biodiversity loss and the stability of ecosystems are among the greatest long-term risks facing our society. These risks emphasize the need to actively drive forward the transition to a bioeconomy—not only as an ecological imperative, but also as a strategic opportunity for innovation and growth.

Overcoming Financing Gaps: The Importance of Specialized Investors

Innovative bioeconomy companies often face complex hurdles, especially in the growth phase. Scaling up biotechnological processes is capital-intensive and requires specialized expertise. Regulatory hurdles and fragmented authorization procedures within Europe often delay market entry and increase costs. In addition, public funding is predominantly focused on early-stage research, while private investors expect quick returns—a discrepancy that slows down many start-ups in the scale-up phase.

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Michael Brandkamp, European Circular Bioeconomy Fund (ECBF)

Financing such companies requires experienced investors with a deep understanding of the specific challenges of the bioeconomy. In addition to technological expertise, market knowledge and a long-term view of regulatory developments are crucial. Successful scale-ups show that targeted investments not only enable technological breakthroughs but can also open up access to large markets.

One example of this is the Belgian company AmphiStar. With a technology for the production of microbially derived glycolipids from food waste, AmphiStar offers a sustainable alternative to palm oil and petroleum-based surfactants. This innovation enables a CO_2 reduction of up to 60 per cent compared to conventional surfactants and at the same time contributes to closing raw material cycles. Such examples illustrate the potential of the bioeconomy to combine both ecological and economic goals.

Another example is the Finnish company Paptic, which has developed an innovative fiber-based packaging to replace plastic in flexible packaging. Paptic combines the recyclability of paper with the functional properties of plastic, such as water resistance and stretchability. The company's materials are already used in over 50 countries and offer a sustainable alternative for applications such as shopping bags or flexible packaging. With the support of specialized investors, Paptic has been able to expand its production capacities and scale up its technology to an industrial level.

The French company Ecoat also impressively demonstrates how bio-based solutions can transform traditional industries. Ecoat develops

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sustainable binders for paints and varnishes based on plant-based raw materials that can replace fossil alternatives. The company's products are characterized by their high environmental compatibility and at the same time meet strict industry performance requirements. Through targeted investments, Ecoat has been able to expand its market presence and establish partnerships with leading chemical companies.

Cooperation as the Key to Success

The transformation towards a bio-based circular economy requires close collaboration between start-ups, established companies and specialized investors. Large companies have strengths in scaling and implementing innovations, while start-ups can often react more quickly to new technological trends. External innovation is therefore becoming increasingly crucial for large corporations—whether through collaborations or targeted investments in young growth companies.

Events such as the ECBForum 2025 on 24 June in Amsterdam offer a platform to promote such partnerships. Stakeholders from industry, research and investment meet here to exchange views on current developments and jointly discuss ways to accelerate the bioeconomy transformation. Topics such as new financing instruments for growth companies and regulatory trends will take center stage.

Strategies for Long-Term Success

In addition to technological innovations, strategic orientation also plays a decisive role in the successful transformation to a bioeconomy. Companies must adapt their business models in order to benefit from the new market conditions. This includes not only the integration of sustainable technologies into existing processes, but also the development of new business models based on circular principles.

External innovation is becoming increasingly important for large companies—whether through collaborations with start-ups or through strategic investments in specialized venture capital funds with a focus on bioeconomy technologies. Access to a broad network of innovative players enables established companies to recognize trends at an early stage and adapt their value chains accordingly.

Why Act Now?

Despite the current economic challenges, the bioeconomy remains a key building block for a resilient economy and a response to global problems such as climate change and biodiversity loss. The chemical industry has the opportunity to play a leading role—through targeted collaborations with innovative start-ups and by investing in sustainable technologies.

The examples of AmphiStar, Paptic and Ecoat impressively demonstrate how bio-based innovations can not only create ecological benefits, but are also economically viable. These companies exemplify the potential of the bioeconomy to open up new markets and transform existing value chains in a sustainable way.

The next few years will be crucial in driving these developments forward. Strategic partnerships between industry players and specialized investors can help Europe maintain its leading role in the bioeconomy—not only for the benefit of the economy, but also for a more sustainable future for generations to come.

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Navigating Through Rough Seas

The Pharma Outlook 2025 Shows: Times for the Biotech and Pharmaceutical Sector Are Particularly Challenging

On the one hand, new treatment options are being brought to market in ever shorter cycles. On the other hand, expiring patents, increasing competition, cost pressure and, in some cases, falling productivity in research and development are putting the viability of the pharma and biotech business model to the test. Last but not least, the US government brings with it considerable uncertainty. How can biopharma companies navigate this complex situation?

One might think things are going well for the pharmaceutical industry: Hemgenix for the treatment of hemophilia B came onto the market at a launch price of $3.5 million, securing the title of the most expensive drug ever. GLP-1 appetite suppressants, known as weight loss injections, are selling like hotcakes and generating billions of dollars in sales for manufacturers. And high-priced drugs costing more than €3,000 per pack account for almost €15 billion a year in Germany, nearly a third of all pharmaceutical expenditure by the statutory health insurance system.

$350 Billion Patent Cliff

Indeed, many pharmaceutical executives are quite optimistic about their business expectations in 2025. However, it cannot be overlooked that industry in Europe and the US is facing challenges that have never been seen before in this combination. In its report "Biopharma trends 2025" the Boston Consulting Group (BCG) points out that pharma is fast approaching a steep patent cliff, as drugs representing some $350 billion in annual worldwide revenues will lose their exclusivity (LoE) from 2025 through 2030. Within this, the top 20 pharma companies account for 80% of this revenue loss.

This includes several mega blockbuster brands losing exclusivity by the end of the decade, e.g., Keytruda, Gardasil, Eliquis, Jardiance or Opdivo. Markus Gores and William Harries, Vice President and Engagement Manager at IQVIAs EMEA Thought Leadership team, predict that further LoE events in the early 2030-ies are expected to result in another $200 billion of revenue exposure for the industry: "This imminent patent cliff creates an imperative to start replenishing revenue now."

In addition, many pharma managers view competition from generic drugs and biosimilars as a top trend. Furthermore, the period of market advantage for new drugs is shortening as rapid innovation fuels heated competition in key disease areas, says BCG. "Treatment paradigms are evolving quickly as new therapies with varying mechanisms of action (MoAs) come to market in rapid succession."

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Thorsten Schüller, CHEManager

Rethinking R&D Strategies

In this environment, however, the question arises as to whether biopharma development departments can bring new active ingredients to market quickly enough and in sufficient quantity and quality. In its "2025 life sciences outlook", accounting and consulting firm Deloitte points out, that declining R&D productivity is a significant industry concern. 56% of biopharma executives that have been surveyed by the company said their organizations need to rethink their R&D and product development strategies over the next 12 months. Nearly 40% emphasized the importance of improving R&D productivity to counter declining returns.

Concern about US Regulations

And the list of challenges continues: C-suite executives identified pricing and access to drugs and medical devices as significant issue facing the life sciences industry. Bill Coyle, author of the management consulting and technology firm ZS, sees pressured health systems, demographic shifts and hostile policy as a potential burden for the industry.

> *"This imminent patent cliff creates an imperative to start replenishing revenue now."*
>
> Markus Gores and William Harries, Vice President and Engagement Manager at IQVIAs EMEA Thought Leadership Team

Fittingly, according to the Deloitte US Center for Health Solutions, about one-third of life sciences executives expressed concern about potential

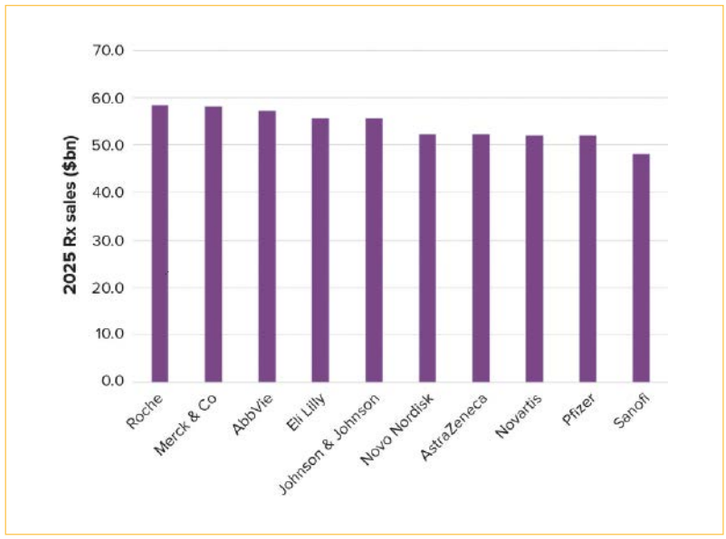
changes to US regulations in 2025, while 37% are apprehensive about global regulatory changes and geopolitical uncertainties.

Indeed, the unpredictable policies of the Trump administration are a big unknown for pharma and biotech. According to IQVIA experts Gores and Harries this has the potential to create significant headwinds for dealmakers, for example, the exact details of future health policies; a shakeup of the FDA—at the beginning of April, the US government laid off 10,000 employees from the most important health authorities, including FDA—; US drug pricing, including possible amendments to the Inflation Reduction Act (IRA) or the introduction of new measures to bring down the cost of medicines for Americans. Also worth mentioning here are tariffs and their impact on global trade, economic growth and inflation. Furthermore, the US-China strategic rivalry or the wider deglobalization might be a challenge.

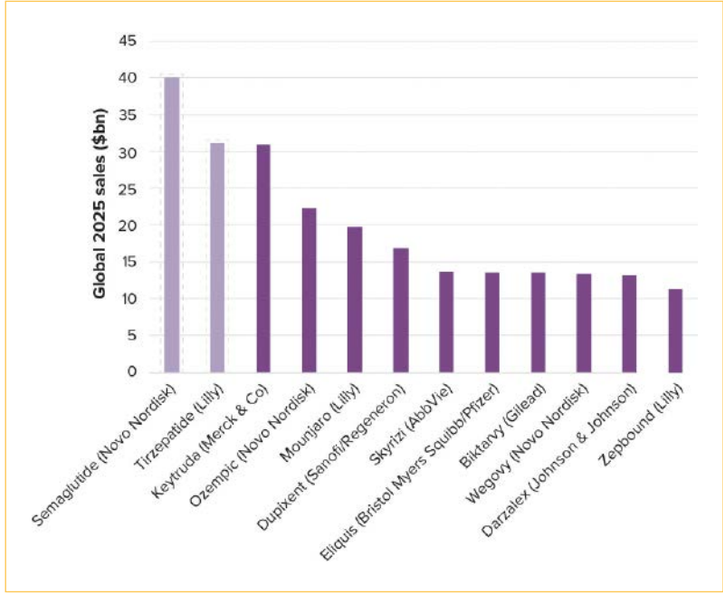
"Treatment paradigms are evolving quickly as new therapies with varying mechanisms of action (MoAs) come to market in rapid succession."

On the other side, these US political changes are not necessarily negative, argues the research firm Evaluate Pharma. "A less hawkish Federal Trade Commission should inject life into a moribund M&A market, hence the expectations for a pickup in dealmaking. … More IPOs and M&A are good news for venture investors, and private financings are also seen rising in 2025."

In addition, China is rapidly emerging as an innovation hub, posing opportunities for sourcing innovation. At the same time, seizing its potential as a commercial market is becoming more challenging because of the potential introduction of new tariffs and trade barriers.



Biggest drugmakers by prescription sales.



Top selling drugs in 2025.

Germany — a Special Case

If we look at the German pharmaceutical market, there are some special features. "Like the rest of the economy, the pharmaceutical industry is also suffering from the structural problems in Germany as a business location", says Kai Joachimsen, Managing Director of the Federal Association of the Pharmaceutical Industry (BPI). "We currently have a bad quartet of excessive bureaucracy, a shortage of skilled workers, high energy costs and a crumbling infrastructure. In addition, pharmaceutical policy needs to become much more innovation-friendly again. Generics production in Germany must also become worthwhile again."

AI Likely to Drive Changes

Despite these challenges, there are also bright spots on the pharmaceutical horizon. Industry experts largely agree that technological advances, most notably Artificial Intelligence (AI) and new translational models, will accelerate drug discovery in coming years. For example, Deloitte points out that digital transformation remains a key focus in the life sciences industry, driven by advancements in cloud computing, generative AI, and other digital technologies. "These innovations provide companies with new opportunities to enhance their products, services, operations, and strategic decision-making, according to survey respondents."

BCG says: "The ability of AI to analyze vast data sets quickly, screen compounds, and design potential drug candidates could help shorten timelines and reduce the cost of preclinical activities, giving companies with strong AI capabilities an edge over those using traditional methods."

In this context the World Economic Forum points out, that by 2025, it is estimated that 30% of new drugs will be discovered using AI. "AI is not just another tool for data analysis; it holds the potential to completely transform the drug discovery and development process by identifying potential drug candidates and understanding efficacy. We are moving towards an era of personalized treatment which will be greatly facilitated by AI."

Spending on AI in healthcare is projected to reach $188 billion by 2030, representing a 37% compound annual growth rate from 2022. Bill Coyle, ZS: "It's hard to argue with investing in gen AI when you see it can diagnose cancer with 96% accuracy or that it outperforms nurses on critical tasks at a fraction of the cost. While more needs to be done to ensure patient safety and enable broad adoption, AI's potential is incredible."

"We currently have a bad quartet of excessive bureaucracy, a shortage of skilled workers, high energy costs and a crumbling infrastructure."

Kai Joachimsen, Managing Director of the Federal Association of the Pharmaceutical Industry (BPI)

The Power of Deals

Furthermore, over the years M&A activities have been a reliable source of innovation for some large life sciences companies. As 2025 gets underway, the fundamentals in support of dealmaking remain strong, point out IQVIA authors Gores and Harries. However, not all acquisitions meet expectations. Factors such as clinical trial uncertainties, integration challenges, and strategic misalignment can limit intended benefits.

Majority Optimistic

Weighing up the challenges and drivers for the pharmaceutical industry, 75% of global life sciences executives are optimistic about the year ahead, according to Deloitte. This optimism is fueled by strong growth expectations, with 68% of respondents anticipating revenue increases and 57% predicting margin expansions in 2025. Additionally, ongoing advancements in science and technology could lead to more breakthrough innovations.

Thorsten Schüller, CHEManager

Motivation, Innovation, and the Power of Collaboration

Leading the Way in Pharmaceutical Manufacturing by Fostering an Agile Mindset and an Inclusive Culture

What drives industry professionals and what is their motivation to lead and innovate? In our new interview series CHEManager Leaders & Motivators, we explore two sides of every leader's story: what inspires and motivates them personally, and how they, in turn, inspire and motivate others. One of them is George Shlieout, Head of Manufacturing Science & Technology at Aenova, a one-stop-shop CDMO in the healthcare industry. A pharmacist by education with a PhD in Pharmaceutical Technology and Biopharmacy, Shlieout is a highly accomplished, goal-oriented, and performance-driven professional with over 20 years of extensive experience in the pharmaceutical industry. CHEManager asks him about current drug development trends as well as his personal motivations and experiences leading and inspiring high-performing teams in a rapidly evolving industry.

CHEManager: What are the biggest challenges the pharmaceutical industry is facing today in order to secure medical care for the growing world population in the future?

George Shlieout: The pharmaceutical industry faces several key challenges in ensuring medical care for a growing global population. Rising drug development costs and complex regulatory hurdles contribute to long timelines and high expenses. Ensuring affordable access to medicines, especially in low-income regions, remains a critical issue, further strained by an aging population's increasing demand for chronic disease treatments. Supply chain vulnerabilities pose risks to drug availability, while pricing transparency and public perception fuel ongoing debates. Additionally, ethical and political pressures influence regulatory decisions, and environmental sustainability is becoming a growing priority for greener manufacturing and waste management.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George Shlieout, Head of Manufacturing Science & Technology, Aenova

How can these challenges be addressed?

G. Shlieout: Addressing these challenges require innovation, cooperation, and strategic approaches to ensure future healthcare access. Contract Development and Manufacturing Organizations (CDMOs) like Aenova play a crucial role by providing time efficient, cost-effective and flexible solutions for drug development and manufacturing. They help pharmaceutical companies scale up production, reduce time to market and therefore costs, and manage complex manufacturing challenges, enabling faster access to medicines and supporting innovation, particularly for small and mid-sized drug developers. Aenova also supports the global supply chain by ensuring high-quality, efficient production to meet the growing demand for medicines.

What are recent innovations in manufacturing science and technology that have the potential to speed up the drug development and production process?

G. Shlieout: We have made significant strides in improving cancer treatment through innovative scale-up approaches and well-designed manufacturing processes. These innovations aim to enhance the efficiency, quality, and speed of producing cancer therapies, ultimately improving patient outcomes. Some key approaches include the implementation of streamlined manufacturing process and quality by design (QbD) strategy during technical transfer leading to increased efficiency by reducing production time and cost, enhancing product consistency and quality by eliminating batch-to-batch variability, and enabling faster scalability in response to demand, which is particularly important for high-demand cancer drugs or personalized treatments. I would also mention the implementation of advanced technology platforms, for example, hot melt extrusion, spray drying and lipid-based formulations, enabling an improvement of bioavailability of poorly soluble drugs or active pharmaceutical ingredients—APIs. This is not new to humanity, but it reflects very well the market-oriented, value-oriented and holistic approach of Aenova.

What role does internal and external collaboration play in your approach to managing Aenova's global manufacturing network?

G. Shlieout: Collaboration is fundamental to effectively managing our global manufacturing network, ensuring operational efficiency, regulatory compliance, and customer satisfaction.

Internal collaboration is crucial for securing cross-functional integration of teams from R&D, quality assurance, regulatory affairs, and supply chain, that must collaborate to ensure seamless product development and production. Additionally, internal collaboration helps maintain global manufacturing standards—for example, GMP compliance—across multiple sites. Internal collaboration also secures operational efficiency via sharing best practices and continuous improvement initiatives across manufacturing plants to enhance efficiency and reduce costs. Furthermore, integrating digital platforms enable real-time monitoring, predictive analytics, and quick decision-making. Last but not least implementation of risk management and ensuring close coordination between sites helps identify potential disruptions and implement mitigation strategies quickly.

External partnerships with CROs, active pharmaceutical ingredients manufacturers, and suppliers expands capacity and capabilities while maintaining our agility. Fostering collaboration with equipment and raw material suppliers, packaging material and logistics partners ensures supply chain

resilience, steady supply and distribution efficiency. Partnering with academia, pharmaceutical innovator firms, and technology providers accelerates innovation, secures technology transfer, and enhances production capabilities.

Last but not least, external collaboration with sustainability organizations helps in reducing the environmental impact of manufacturing processes. Aenova is making considerable investment in state-of-the-art cogeneration plants and photovoltaic systems and additionally, set periodic site energy audits for optimization.

Previous to Aenova you worked for almost 20 years in pharmaceutical development functions at Solvay and Abbott, respectively. How does working for a medium-sized CDMO in your current role differ from working for Big Pharma?

G. Shlieout: I joined Solvay Pharmaceuticals in 2002, and shortly after Solvay was acquired by Abbott Laboratories. My journey in Big Pharma shaped my knowledge, expertise and my leadership style. I worked in R&D and in Operations (MS&T) and contributed to the development and commercialization of many products in the global market. Additionally, I had the opportunity to be part of several scientific advice meetings with many regulatory agencies like US-FDA, Japan FDA, and many European and emerging market countries. Furthermore, I was leading global teams in different locations in Europe, India, Singapore, Brazil and other Latin American countries.

Working for a medium-sized CDMO differs significantly from my time in Big Pharma at Solvay and Abbott, particularly in terms of flexibility, customer focus, and decision-making dynamics.

In a CDMO, the focus is on serving multiple clients with diverse needs, whereas in Big Pharma, R&D and manufacturing are more internally driven. At Aenova, we must be highly adaptable to different customer requirements, regulatory expectations, and project timelines. Additionally, medium-sized CDMOs tend to be more agile in decision-making. Unlike large pharmaceutical corporations, where processes can be more complex and hierarchical, a CDMO can often implement changes and innovations more quickly, responding dynamically to market and customer demands.

At Aenova, innovation is driven by close collaboration with clients. Unlike in "Big Pharma", where proprietary R&D pipelines dominate, we work across a broad range of products, technologies, and formulations, offering tailored solutions while leveraging our technical expertise. Overall, while Big Pharma offers stability and large-scale operations, working in a CDMO is more dynamic, customer-oriented, and fast-paced, requiring a strong ability to adapt, innovate, and collaborate across multiple projects and partners.

What motivates you about your job at Aenova? Do you see your work more as a profession or a vocation?

G. Shlieout: What motivates me most about my job is the ability to make a tangible impact—both for our customers and ultimately for patients. Working in a CDMO environment means we play a crucial role in bringing a wide variety of pharmaceutical products to market, often acting as the bridge between innovation and large-scale production. The diversity of projects, the challenges of problem-solving, and the need to stay at the cutting edge of technology and regulatory requirements make every day exciting.

> *"Receiving feedback directly from a patient using the product I had helped develop was incredibly impactful."*

I see my work more as a vocation than just a profession. The pharmaceutical industry is not just about business—it's about improving lives. The ability to contribute to the development and production of high-quality medicines that help people worldwide gives my work a deeper sense of purpose. It's also incredibly motivating to collaborate with talented teams, drive innovation, and find solutions that meet both customer and patient needs. At Aenova, the fast-paced, customer-focused nature of our work keeps me engaged, and the impact we make drives my passion for what we do.

Is there a particular incident or success story from your professional life that has confirmed this and even strengthened your dedication?

G. Shlieout: In 2009, I was working for a global company where we developed and launched a product tailored to the needs of Cystic Fibrosis—CF—patients. A year later, I attended the CF Foundation Conference, where I presented a poster, and our company had a booth. One CF patient approached the booth with questions about the medication's use of this product with and without food, and whether this would affect its efficacy. I had just arrived at the booth when a marketing colleague told the patient, "You're in luck; here's the main inventor of the product, and you can ask him directly." The patient turned to me and said, "First of all, I want to thank you for all your work on this successful product. You've improved the quality of my life."

It took me a moment to fully absorb what he said, and I was both surprised and deeply moved. The feeling of pride, joy, and even goosebumps was overwhelming. Receiving such feedback directly from a patient using the product I had helped develop was incredibly impactful. This experience profoundly shaped my professional purpose: "Accelerated building a healthier world."

At Aenova, while we may not be the original innovators of medication, we have a significant impact on medication development, availability and affordability—goals that align closely with my professional purpose. I am truly grateful to be a part of Aenova.

As an expert in leading global and multinational teams, does diversity of ethnicities, cultures, age groups, qualifications, and experiences have a positive impact on success? What is your recipe to turn a diverse team into a successful entity?

G. Shlieout: Yes, diversity in all its forms—ethnic, cultural, generational, educational, and experiential—has a strongly positive impact on a team's success. A diverse team brings a broader range of perspectives, problem-solving approaches, and innovative ideas, which is crucial in an industry as dynamic as pharmaceuticals. It fosters creativity, enhances adaptability, and enables better decision-making by challenging conventional thinking.

However, and based on my experience in multinational big pharma companies, diversity alone is not enough—it needs to be effectively managed to become a true asset. My recipe for turning a diverse team into a successful entity includes having a clear vision, common goals and leveraging strengths and complementary skills, empowering team members to take ownership of their tasks and decisions, building trust by being fair, consistent, and supportive, and fostering an agile mindset that embraces change as an opportunity. Also, it is important to create an inclusive culture by fostering an environment where everyone feels valued and heard. This is reflected in one of Aenova's core values "Everyone matters". I encourage open communication and respect for different viewpoints, and I lead by example and show appreciation for different cultural and professional backgrounds.

A well-managed diverse team is not just more innovative and productive but also more resilient, capable of navigating global markets, and better equipped to solve complex challenges. The key is to turn differences into strengths and create a team that thrives on collaboration and mutual respect.

CDMOs like Aenova play a crucial role by providing time efficient, cost-effective and flexible solutions for drug development and manufacturing.

■ www.aenova-group.com

Rethinking Growth

Phytoinitiator mRNAs as a Game Changer in Agriculture

Global warming, pollution, and climate change are the greatest challenges of the 21st century. Nature is a powerful ally in the fight against these global crises, but many regions of the world, from parched deserts to polluted industrial sites, offer little chance of survival for many beneficial plants. However, a new technology promises to overcome these obstacles and allow plants to thrive under extreme conditions and stress. Could this innovation have the potential to solve our environmental problems?

Imagine it was possible to grow plants in extreme conditions: in barren deserts or saline soils. Normally, seeds and even adult plants react very cautiously and wait for better conditions, which in these cases are unlikely to occur. The addition of phytoinitiators, which include phytoinitiator-mRNAs extracted from newborn chloroplasts of germinating seeds, enables the plants to grow and thrive despite the almost impossible conditions. The plants behave as they did on the day of germination, ignoring the stress they are actually under. This has nothing to do with gene modification; the unmodified phytoinitiator-mRNA extracted from the chloroplast of the seedling is used.

Plant Growth Under Extreme Conditions

Chloroplasts, known for their role in photosynthesis, are significantly involved in the synthesis of several plant hormones and enzymes, especially those that play a role in stress and defense reactions as well as in growth. By adding phytoinitiators, we give plants the ability to act efficiently and thus ensure their survival.

Phytoinitiators are like an insurance policy because they provide an optimal defense mechanism against hostile conditions. This applies to organically activated processes (OAPs), where plants actually have to contend with difficult conditions such as extreme heat, drought, poor soil etc. But it also applies to primary stress reduction (PSRs), where plants have optimal conditions but still do not perform as desired. Both processes can be controlled with the phytoinitiators and optimally tested in field trials.

"By adding phytoinitiators, we give plants the ability to act efficiently and thus ensure their survival."

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Anne Lakmanaarachchi, PhytoAR Biotechnologie

The principle investors, Anne and Don Lakmanaarachchi, believe that this is just the beginning of a new breakthrough in plant growth technologies: "Despite the incredible success of plant growth using phytoinitiator-mRNAs, we are still at the very beginning of unimagined possibilities."

In the face of advancing climate change, it is clear that sustainable innovations could fundamentally change not only the environment but also the economy. A revolutionary product at the molecular level that allows plants to grow under extreme conditions could become a crucial tool—not only in the fight against

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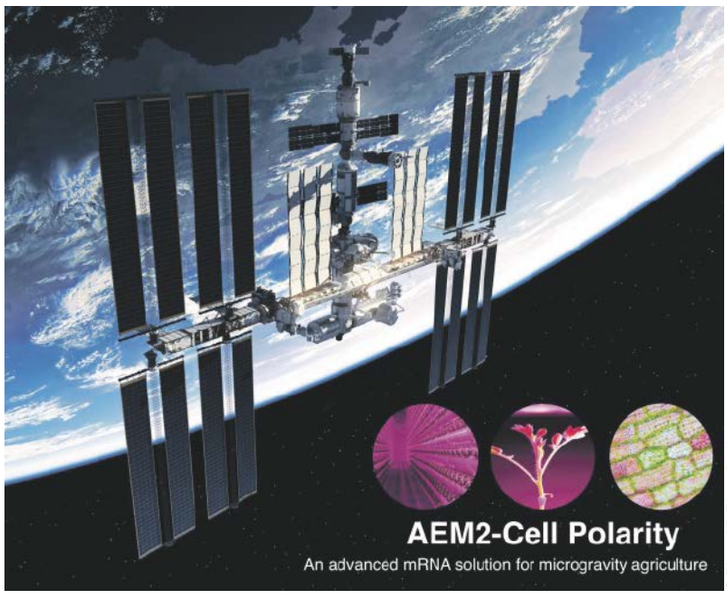
global warming but also as a driver of economic growth and social stability.

Increased Yields in Previously Untapped Regions

A major advantage of this technology is the possibility of expanding cultivation areas and enabling high-yield harvests on soils and in climate zones that were previously considered uncultivable. Regions that are currently unusable for agriculture due to drought, soil salinization, or extreme temperatures could become economically attractive thanks to this technology. The development of such areas means an enormous increase in production without additional pressure on fertile arable land—a real expansion of global agricultural capacities.

Climate-related crop failures cost the agricultural industry billions every year. A product that makes plants more resilient can minimize crop failures and thus counteract the financial risks. This not only reduces losses but also increases planning security for agricultural companies and farmers. Investments in this technology could help to keep food supplies and prices more stable in the long term, which is beneficial for everyone involved along the value chain.

"Despite the incredible success of plant growth using phytoinitiator-mRNAs, we are still at the very beginning of unimagined possibilities."



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AEM2-Cell Polarity: An advanced mRNA solution for microgravity agriculture

More Sustainable Production and Resource Efficiency

The ability to grow plants in extreme environments reduces the need for scarce resources such as water and fertilizers. This efficiency is not only an economic advantage but also has an environmental impact: Reduced water consumption and lower fertilizer loads mean less pollution and less strain on ecosystems. The sustainable dimension of this technology is a key advantage for companies that are increasingly focusing on environmentally friendly and "green" innovations.

The introduction of such a product would enable the development of new markets—especially in countries with difficult growing conditions. This technology could become a central component of growth strategies by appealing to new customer groups that were previously restricted due to their environmental conditions. Targeted marketing to regions and countries with severe climatic challenges could not only promote sales growth but also strengthen a group's market position and brand image.

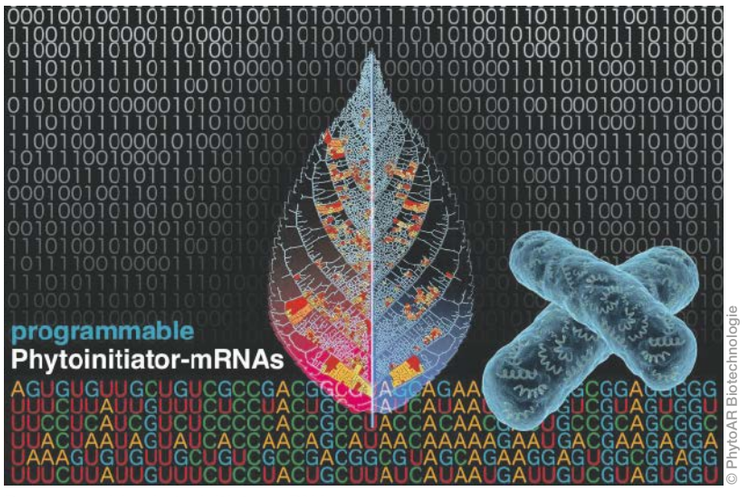
The ability to grow agricultural products even under difficult conditions could help to improve food security globally and thus promote political and social stability. Markets and countries that traditionally rely on food imports could secure part of their own supply, reducing dependency and the risk of price fluctuations. This stability is also beneficial for global corporations, as it makes long-term investments and sales markets more predictable and stable.

Conclusion and Outlook

A product that allows plants to grow in extreme environments could revolutionize agriculture worldwide. For large corporations, such a technology offers enormous economic potential and competitive advantages. From increasing yields in inhospitable regions to stabilizing food prices and reducing environmental impact, the introduction of such an innovation could not only increase sales and market share but also actively contribute to overcoming global challenges. At a time when sustainability and food security are becoming increasingly central issues, this product is the key to successful and future-oriented business development.

The first product based on phytoinitator technology will be ready for the EU market in mid-2026 due to the lengthy and complex development process. PhytoAR has patented a new mRNA technology called AEM2 technology, which is based on AEM2 mRNAs for the growth of plants in microgravity (in the gravity of the ISS, Mars and the moon). A matrix of special group of mRNAs from seedling leucoplasts has been successfully configured. This matrix generates an alternative for the gravity requirement in the cell membrane of the plant, what is called "pseudo-gravity". This behaves as an alternative to the earth's gravity so that auxins, an important plant growth hormone responsible for controlling root and shoot development, can be evenly distributed in the plant in microgravity. This is achieved by the localization of PIN proteins along the cell membrane, which enable a structured auxin flow even without gravity. The potential of this innovative technology is not yet foreseeable. The AEM2-mRNA matrix offers infinite possibilities for configuration, even targeted to specific applications. As this field is still untouched, it opens up a completely new area of research. The trend towards environmentally friendly and biologically based technologies is expected to increase further in the coming years. As research progresses, new areas of application could be opened up, ranging from food production and environmental remediation to the development of sustainable agriculture in space.

"From increasing yields in inhospitable regions to stabilizing food prices and reducing environmental impact, the introduction of such an innovation could not only increase sales and market share but also actively contribute to overcoming global challenges."



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Programmable phyto-initiator mRNAs

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The Trump Tariffs

Reactions by the Chinese Chemical Industry

While US President Trump's recent tariff policy has been wildly unpredictable, it seems clear that high tariffs on imports from China are a core element. At the time of writing this, they stand at 145% and thus are a massive obstacle to exporting chemicals from China to the US. How is China's chemical industry respond to this?

The initial reaction has mostly been defiant, mirroring the reaction of the Central Government. Specifically, there are three types of statements coming from Chinese chemical companies and the Chinese media:

1. "It will mainly hurt the US"

Chinese news media points out that the US is one of the world's largest importers of laboratory equipment and reagents. Thus, it is claimed that the new round of tariff policies will lead to a sharp increase in the prices of US scientific research equipment and supplies, once again causing a serious impact on US scientific research.

2. "It does not matter much"

For example, ChemChina stated that the company's overseas business covers more than 80 countries and regions around the world, mainly along the "Belt and Road" countries. According to ChemChina, the US tariff adjustment has little impact on the company, and the company's overseas business has not been affected at present.

3. "It will hurt a bit, but there will also be benefits"

For example, Satellite Chemical states that the 34% tariffs on ethylene imports to China will increase costs by 3 – 5%, but that the reduction in imports will lead to a domestic supply gap, and product prices will rise, offsetting the impact of the tariffs.

A financial analyst states that while the US tax increase has a negative impact on chemical products, China's countermeasures may bring considerable benefits to some chemical products by increasing domestic price levels. Some products may also be produced by different production methods than currently due to the changed raw materials costs, which may benefit technologies such as MTO (methanol-to-olefin).

My personal judgement is that these statements are too optimistic and reflect more a combination of wishful thinking and the desire to support the government's stance. Given the current weak state of China's economy, the tariffs and retaliatory tariffs will cause some pain. On the other hand, exports to the US account for only about 10% of China's chemical exports and about 1% of China's total chemical sales. In addition, the country has made great progress in establishing its domestic chemical value chains. So, I do not expect the tariffs to be catastrophic for the Chinese chemical industry.

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Kai Pflug, Management Consulting – Chemicals

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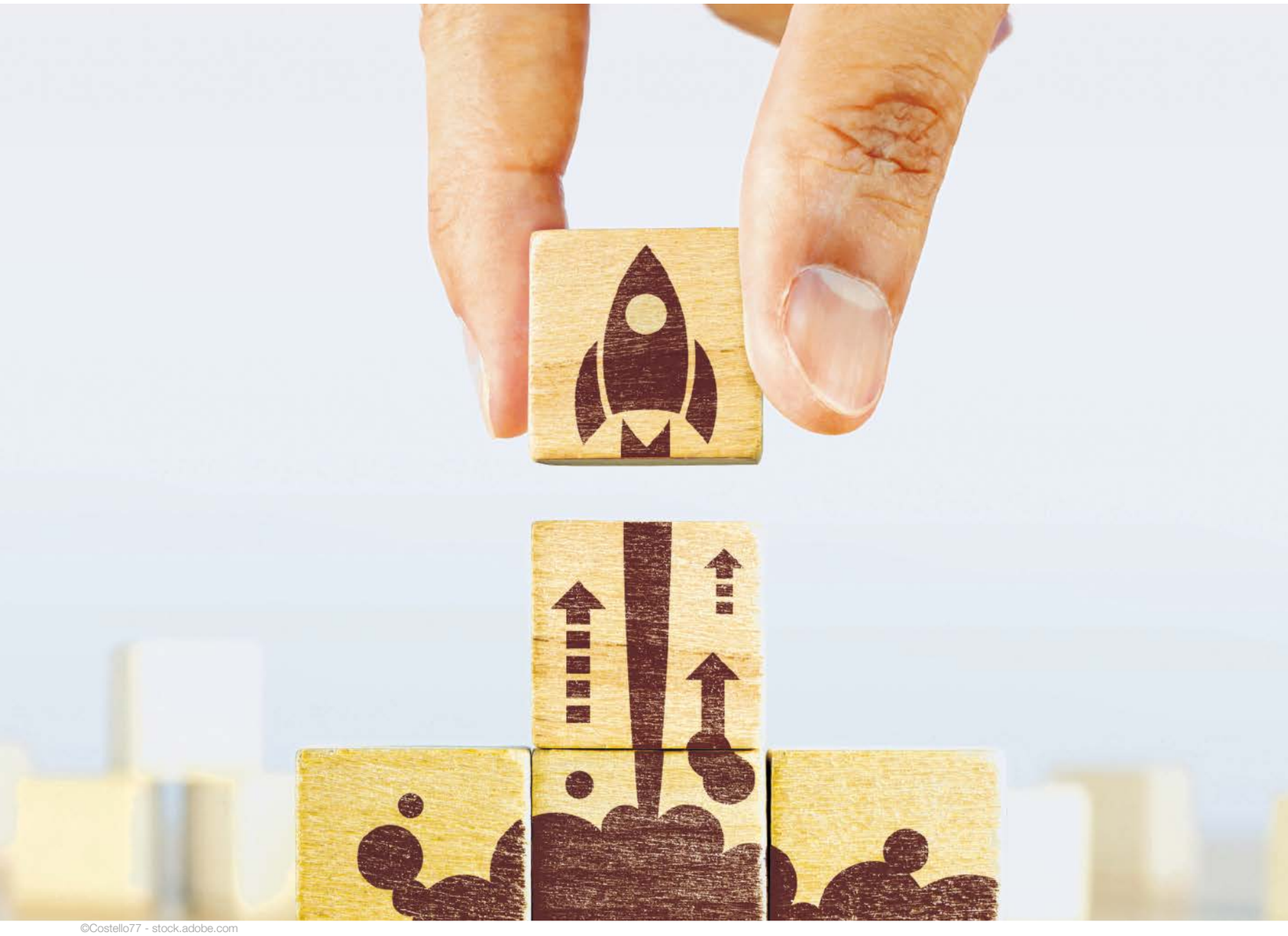

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Innovative PLA Catalyst Solution

Enhancing Manufacturing with Faster, Cleaner, High-crystallinity Processes

The Discourse on Green Chemistry Interactive Pitch Competition, held on November 5, 2024, at Wiley's Berlin office, showcased innovative projects from early-stage startups addressing environmental challenges. Cohosted by CHEManager and GreenChem, the event saw SustainCat impress the judges with their approach to sustainable chemistry. Their innovative solutions earned them the Jury Prize. As part of their prize, they are featured in this issues CHEManager Innovation Pitch. As the Jury Prize Winner of The Discourse on Green Chemistry Interactive Pitch Competition, SustainCat demonstrated a high-performance catalyst that streamlines Polylactic Acid (PLA) production, cutting costs and energy consumption while improving the crystallinity and molecular weight. This innovation involves melt-phase condensation followed by solid-phase condensation, utilizing acidic supported solid catalysts, specifically calcined zirconium sulfate supported on carriers like SiO_2.

© SustainCat

SustainCat Team from left to right: Juan Sebastian Romero, Johannes Häufler, Huaiyou Chen.

CHEManager: What was the starting point and the motivations of SustainCat?

Johannes Häufler: Our multidisciplinary team was formed in the Treasure Hunting Summer School at the TU Berlin's Innovation Center. During this program, we discovered the potential of our patent and decided to continue working on it together. We applied to take part in the pitch course and discourse of Berlin Science Week x Wiley x GreenCHEM. As a result, we were able to celebrate our first success with a successful innovation pitch.

What sets SustainCat apart from existing solutions in the market?

Juan Sebastian: We stand out by enabling direct polycondensation of L-lactic acid through melt-phase and solid-phase condensation, simplifying production and cutting PLA manufacturing time by 3 – 5 times. Unlike conventional catalysts, SustainCat is easily removed via mechanical filtration and can be directly reused, eliminating toxic residuals. It also achieves 60–80% crystallinity, which enhances heat resistance, speeds up processing, and makes it ideal for fiber applications and injection molding. In contrast, traditional tin-based catalysts rely on ring-opening polymerization, reach only 40% crystallinity, and leave behind impurities that are difficult to remove.

What are the advantages of the solution SustainCat proposed?

J. Sebastian: The development of catalysts that fasten the polymerization without any undesired side effects is of great interest. We are now able to present oxo-anion modified metal oxides as catalysts that fasten the pre-condensation of lactic acid, especially zirconium sulfate tetrahydrate (ZrS_2O_8) that was calcinated at 450 – 550 °C. A second positive effect is the insolubility of the catalyst within the reaction mass making it easily separable. First experiments produced nearly 100 mol% L-lactic acid units even at high conversion and catalyst concentration.

Who are your target customers, and what specific problems are you solving for them?

Huaiyou Chen: Our primary target customers are PLA manufacturers looking to enhance the sustainability and cost-effectiveness of their production processes. We're helping them stay competitive against conventional plastics and other bioplastics. By making PLA production greener, non-toxic, and recyclable, we help cut costs in this growing market. High performance catalyst manufacturers could also be our customer per patent licensing. And if needed, we're also open to supplying products directly to PLA end users.

What's the vision for SustainCat? Where do you see your team in five years?

J. Häufler & H. Chen: Our immediate goal is to secure funding to validate our business model. We are focusing on conducting a techno-economic analysis to assess the commercial feasibility of our innovative direct polycondensation process for PLA production. Based on the current granted patent, a subsequent patent is in the plan. This will provide a solid foundation for our next steps.

In the next five years, we envision two potential pathways: establishing an SME-industry cooperation or founding a startup to commercialize our technology. By demonstrating the efficiency, cost-effectiveness, and sustainability of our approach, we aim to attract industrial partners interested in sustainable plastic and high-performance catalyst solutions.

Our long-term vision is to make PLA production significantly more sustainable and economically viable, reducing reliance on traditional, energy-intensive methods. With the support of TU Berlin and GreenCHEM, we are positioning SustainCat as a key player for affordable and competitive biodegradable plastics.

Personal Profiles

Huaiyou Chen is a PhD researcher in Material Sciences at TU Berlin, specializing in biomaterials processing, e.g. additive manufacturing of fungal mycelium materials. He holds a binational Master's degree in Polymer Science and a Bachelor's in Chemical Engineering and Technology. Combining a strong R&D background with industrial experience at BASF, he is enthusiastic and well-equipped for PLA catalyst development.

Juan Sebastian is a Master's student in Polymer Science at HU Berlin, with expertise in polymer synthesis and metal-organic frameworks. His current research focuses on the synthesis and post-modification of mesoporous materials. Driven by an entrepreneurial spirit, he is motivated to explore opportunities in chemical innovation and business development.

Johannes Häufler is a Master's student in Civil Systems Engineering at TU Berlin with expertise in life cycle analysis and computer-aided engineering. He has 3 years of experience in circular engineering consulting for the real estate sector, applying circular economy and cradle-to-cradle principles to develop sustainable solutions and drive innovation.

BUSINESS IDEA

Greener PLA, Smarter Production

The global PLA market is growing due to the rising demand for biodegradable plastics and sustainable materials, expected to reach USD 3.3 billion by 2028. Conventional PLA production relies on energy-intensive ring-opening polymerization of lactide, which increases costs and limits scalability. SustainCat addresses these industry challenges through an innovative catalytic process that allows direct polycondensation of lactic acid to PLA, offering substantial improvements over existing technologies:

- **Cost & Time Efficiency:** Reduces PLA production time by 3–5 times, improves manufacturing efficiencies, cuts time and energy consumption, enhances industrial competitiveness.
- **Improved Material Properties:** Achieves high molecular weight and 60 – 80% crystallinity, enhancing mechanical strength, suitable for applications requiring high mechanical strength and hardness, such as packaging, automotive components, and medical devices like resorbable surgical sutures.
- **Environmental and Health Safety:** Unlike traditional tin-based catalysts, which can introduce toxic residues into the final product, this process uses non-toxic, solid catalyst, ensuring both the production process and final products are free from harmful substances.
- **Recyclability:** The solid catalyst can be easily removed from the final product and can be reused, significantly reducing waste and further contributing to a circular economy.

The technology behind SustainCat is protected by a granted patent, providing a strong foundation for commercialization. Further development continues to refine catalyst performance, assess long-term stability, and expand potential industrial applications.

In addition to PLA producers and catalyst providers, SustainCat also seeks collaborations with end-users in industries such as packaging, textiles, biomedicine, and 3D printing, to offer a timely, high-performance, and environmentally superior alternative to conventional plastics while making sustainable PLA a viable option for mass production.

- SustainCat, Berlin, Germany
  sustaincat@gmail.com

SustainCat

ELEVATOR PITCH

Catalyzing a Sustainable Future

SustainCat is driven by a commitment to addressing the pressing global challenges of plastic pollution through innovative chemical engineering. Our diverse, multidisciplinary team combines expertise in chemistry, material science, engineering, and sustainability, focused on redefining PLA production methods to set a new benchmark for industrial sustainability. By continuously advancing our catalytic technologies and fostering strong industrial and academic partnerships, we aim to lead the transition towards more sustainable plastic manufacturing process.

Milestones

2023
- The concept of SustainCat was born during the Treasure Hunting Summer School at the TU Berlin's Innovation Center, based on the patent on sustainable catalysis in polylactic acid manufacturing.

2024
- Participated in the PitchCourse & Discourse Workshop by Wiley and GreenCHEM.
- Winner of the Jury Prize at the Green Chemistry Interactive Pitch Competition in Berlin Science Week, validating our technology's potential and appeal to both academia and industry.

2025
- Collaboration with TU Berlin laboratories to further develop of the catalytic process and material characterizations.

Roadmap

2025
- Actively pursuing strategic funding opportunities.
- Establish industry partnerships with leading players in PLA manufacturing and catalyst production, targeting early pilot deployment in existing supply chain.

2026
- Submission of a subsequent patent to expand and protect the core innovation, covering novel synthesis pathways.
- Official product launching, including first commercial licensing agreements and direct sales.

2027
- Scale manufacturing capabilities through joint ventures or contract manufacturing.
- Diversification of applications across emerging sectors.

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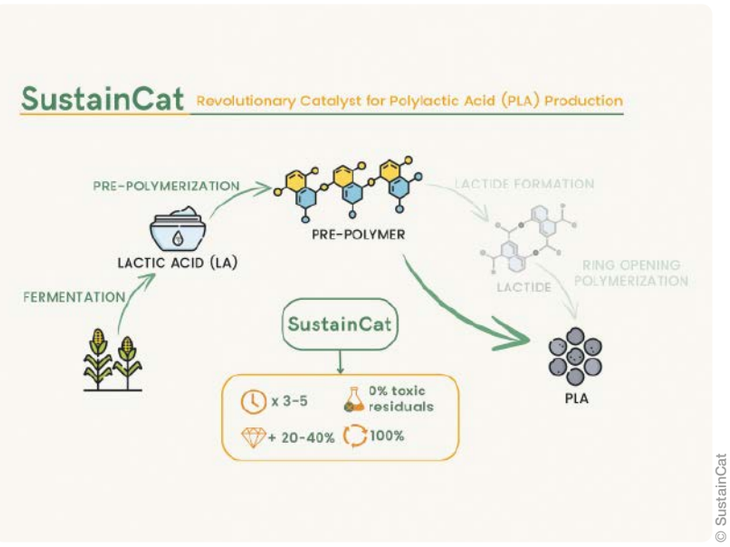
SustainCat presenting at CHEManager International and GreenChem's Berlin Science Week event.



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SustainCat's revolutionary catalyst for polylactic acid (PLA) production.

Smart Tools for a Plastic-Free Future

Cutting Time and Cost of Developing Sustainable Products with AI-Powered Solutions

Materia Bioworks Inc. (Materia) is reshaping the future of sustainable product development. Powered by a computational platform and two-sided biomaterials marketplace, Materia enables consumer brands and manufacturers to bring eco-friendly products to market faster, smarter, and more affordably. From packaging and cosmetics to textiles and biomedical applications, Materia is accelerating the global shift away from petroleum plastics—making sustainability scalable, accessible, and impactful.

CHEManager: What's driving consumer brands and product manufacturers to replace petroleum plastics with sustainable alternatives?

Hasitha De Alwis: Brands are under rising pressure to eliminate petroleum plastics from their products by 2030 due to net-zero targets, single-use plastic bans, and Extended Producer Responsibility (EPR) laws—which require companies to manage the full lifecycle of their products or risk paying fines and fees. Biomaterials offer a powerful solution: they can replace petroleum plastics without compromising functionality. But adoption remains slow. These materials behave differently, require advanced R&D, and can be costly. With the global plastics market nearing $1T the opportunity is massive.

What was the motivation behind founding Materia Bioworks?

H. De Alwis: As the founding team of a Series A bioplastics company, we previously developed four biodegradable products with top-tier brands pursuing ambitious ESG goals—and saw firsthand how hard these solutions were to implement. Even with significant resources, projects took years and millions of dollars due to fragmented supply chains, high development costs, and limited material readiness. We built Materia to solve this by combining our deep materials development expertise into a software platform, with an integrated marketplace, to make sustainable innovation faster, cheaper, and data-driven.

What's the unique advantage of your approach?

H. De Alwis: Materia delivers an end-to-end solution from ideation to product launch. Our proprietary R&D pipeline enables companies to rapidly test and de-risk materials using real-world data. With a click, they get tailored recommendations, faster iterations, and shorter timelines. What once took years can now be done in months.

How do brands, manufacturers, and suppliers benefit from working with you?

H. De Alwis: We help companies explore and validate biomaterials based on performance, cost, availability, and verified sustainability—without committing to a single supplier. This multi-sourcing strategy is key in today's unpredictable supply chains.

- **Brands:** We identify scalable, process-ready materials that cut R&D costs, accelerate time-to-market, and align with sustainability goals via access to a vetted supplier network.
- **Manufacturers:** We simplify material adoption with data-backed insights—reducing downtime, scrap rates, and optimizing drop-in solutions for manufacturing integration.
- **Suppliers:** We help unlock high-value applications and boost demand by connecting materials to downstream customers, our pipeline, and marketplace.

What challenges have you encountered?

H. De Alwis: Education. That's where we come in as the bridge between R&D, product development, procurement, and supply chain. We simplify decision-making and spped up execution.

Personal Profiles

The Materia team previously co-founded a Series A bioplastics company, scaling breakthrough PHA technology with global brands.

Hasitha de Alwis (CEO): 12+ years in sustainable materials. Led IP and tech dev, built a 25+ person R&D team.

Kevin Eriksen (CTO): Led multimillion-dollar AI and bioinformatics projects with $100M+ impact. Now leads tech at Materia.

Michael Williamson (Dir. of Materials Innovation): Bioplastics expert and drove innovation with Fortune 500s. Leads validation and R&D.

Rajan Manocha (Dir. of BD): 12+ years in cleantech sales. Secured $20M+ in contracts with major CPGs. Now drives sales and strategic partnerships.

What's next for Materia?

H. De Alwis: We're scaling quickly. We're expanding our SaaS platform, onboarding top-tier suppliers, and growing global R&D partnerships. We're running customer projects with leading brands to validate our impact, and we're raising a seed round in 2026 to grow our team and technology. We're always open to working with partners ready to make sustainability their competitive edge.

Hasitha de Alwis, Materia Bioworks

Kevin Eriksen, Materia Bioworks

Michael Williamson, Materia Bioworks

Rajan Manocha, Materia Bioworks

Business Idea

AI to Scale Sustainability

Materia Bioworks is transforming how sustainable products are developed and launched. By combining a cloud-based AI platform with a curated biomaterials marketplace, we help brands, manufacturers, and suppliers fast-track product innovation—reducing cost, risk, and time. Our MAPS (Material Application Prediction System) platform integrates real-world testing with predictive analytics to identify the right materials for the right applications, delivering smarter, faster, and more confident decisions.

- Most sustainable products derived from biomaterials don't fail in theory, but they fail in practice due to poor performance, limited scalability, or a lack of validation. Materia addresses this gap by generating application-specific performance data across industries like packaging, cosmetics, food & bev., and consumer goods. We turn trial-and-error into a repeatable, data-driven process that accelerates development and de-risks decision-making.
- Our business model is built to deliver immediate value and long-term scalability. Just 16 months into the company's inception, we're executing client projects with global consumer brands and product manufacturers. These projects are delivering early revenue, generating critical insights, and validating our platform's impact. As we scale, these partners will convert into long-term SaaS users.
- Materia operates on a value-based model. Customers use our platform to develop and validate new products more efficiently, while our two-sided marketplace connects suppliers and manufacturers to move materials seamlessly. This dual-pronged approach drives biomaterials adoption across the entire value chain.
- With global regulations and industry demand accelerating the shift to sustainable materials, Materia is uniquely positioned to become the go-to engine for scaling sustainability—making it easier and more affordable for the world to build greener products.

- Materia Bioworks Inc., Toronto
  www.materiabioworks.com

Elevator Pitch

Fast-Track to Circularity

Materia is building the AI-powered infrastructure for a scalable circular economy. Our platform combines a computational engine with a two-sided biomaterials marketplace, helping brands and manufacturers to navigate the fragmented biomaterials landscape with speed and confidence. We streamline material validation, reduce R&D costs, and accelerate time-to-market. As regulation pushes industries toward sustainable alternatives, our platform de-risks decisions and brings transparency to an opaque space. Our mission is simple: make it easier and faster to bring sustainable products to market.

Milestones:

Q4 2023
- Materia was founded

Q1 2024
- SaaS platform conceptualization and validating product market fit

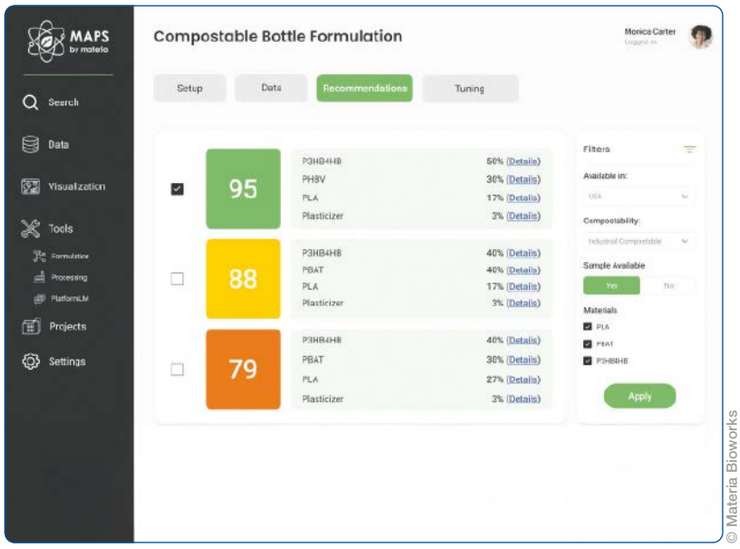
Q2 2024
- Secured Materia's first partnership with a world leading biomaterials supplier

Q4 2024
- Winner of the CodeLaunch AI World Championship
- Secured 8 partnerships with value chain partners including brand owners, manufacturers, and biomaterial suppliers
- Launched biomaterial supplier marketplace

Q1 2025
- Received federal and provincial grants (BioCreate, NSERC, NRC-IRAP)
- Accepted to IndieBio NY (SOSV) accelerator
- Secured the 1st paid client project

Roadmap

Materia is partnering with forward-thinking brands and manufacturers across CPG, food & beverage, cosmetics, textiles, pharma, and more to accelerate the shift from petroleum plastics to sustainable materials. Our AI-powered SaaS platform simplifies and speeds up product development—making it faster, smarter, and more cost-effective to launch eco-friendly innovations. If you're ready to lead in sustainability and stay ahead of regulation, let's talk.



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Compostable bottle formulation recommendations.

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The Materia Bioworks team.

ChemUK 2025

UK's largest annual chemical, laboratory & process industries supply chain expo & conference, ChemUK, will take place on May 21 – 22, 2025, in Birmingham, UK. The event will feature 550+ specialist exhibitors and 100+ expert speaker sessions and, as in every year, also presents features and projects that demonstrate real-world innovative products, solutions, and materials derived from ground-breaking chemistries while reflecting collaborative industry research and partnership.

■ www.chemicalukexpo.com

Chemspec Europe 2025

Chemspec Europe is to take place on June 4 – 5, 2025, in Cologne, Germany. The event is the key platform for manufacturers, suppliers and distributors of fine and specialty chemicals to showcase their products and services to a dedicated audience of professionals in the industry sector. The product portfolio of this event covers fine and specialty chemicals for various industries. Conferences presenting the latest results of ongoing R&D projects round off the show.

■ www.chemspeceurope.com

K 2025

Since the first exhibition in Düsseldorf in 1952, the letter "K" has embodied the fascination for the world of plastics and rubber. K is considered the leading plastics trade fair attracting a large number of professionals from production, processing and related sectors such as mechanical engineering, the automotive, construction, packaging, electronics, and medical technology industry from all over the world. K 2025 will take place October 8 – 15, 2025 in Düsseldorf, Germany.

■ www.k-online.com

CPHI Europe 2025

More than 60,000 visitors are expected to attend CPHI Europe in Frankfurt, Germany, October 28 – 30, 2025. As the world's largest event dedicated to pharmaceutical developments, trends, products, and services CPHI provides an industry-leading setting to network with experts from suppliers and service providers to the pharmaceutical industry and source chemical ingredients as well as pharma manufacturing and packaging equipment.

■ www.cphi.com/europe

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Imprint

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Printed by: DSW GmbH & Co. KG, Ludwigshafen, Printed in Germany

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