

ENERGY STEWARDSHIP

Fast-tracking ZeroCO₂ glass: **VETROPACK** breaks the carbon barrier

Led by IPGR and with the active support of both VETROPACK and RWTH Aachen, The ZeroCO₂ Glass project is pioneering carbon-neutral glass production. By combining alternative raw materials, electrification and collaboration, it is redefining what sustainable glassmaking can achieve - bringing emission-free containers closer to reality.

Decarbonising the glass industry is one of the sector's greatest challenges, yet it is an essential step for the future of glass packaging - and for the environment at large. With its ZeroCO₂ Glass project, International Partners in Glass Research e. V. (IPGR) is charting new territory in the development of emission-free glass products and production processes. Having invested in a state-of-the-art research facility, the IPGR





team is now pressing ahead with trials to manufacture the first glass containers using CO₂-free methods - collecting invaluable real-world insights along the way. Glass manufacturing has traditionally been a highly energy-intensive process, heavily reliant upon fossil fuels. However, mounting pressure from climate targets, shifting regulations and rising public demand for sustainable products is pushing the sector toward a fundamental transformation. Through ZeroCO₂ Glass, IPGR seeks to establish and test a holistic, carbon-neutral production pathway for glass.

DRIVING INNOVATION IN A CLIMATE-CONSCIOUS INDUSTRY

As an international platform for pre-competitive research and development, IPGR is dedicated to making technical and scientific expertise available to its members. By connecting experts across the globe, the organisation initiates collaborative projects to trial new energy systems and alternative raw materials. The ZeroCO₂ Glass initiative exemplifies this mission. The centrepiece of the project is a purpose-built technology station, converted from a former warehouse into a modern research hub. “Our pilot plant is a 1:1 replica of a glassworks in miniature, incorporating every major step of industrial glass production,” explains Dominik Orzol, Managing Director of

IPGR. Planning began in 2021, followed by construction and conversion in 2023. The melting furnace was commissioned in 2024 and, after a brief run-in phase, the first trials commenced this April.

PIONEERING THE PATH TO CO₂-FREE PRODUCTION

A trio of key strategies guides the project’s efforts. First, the researchers are switching to carbonate-free raw materials, which release no emissions during melting. Second, they are rethinking the energy supply. Instead of fossil fuels, the pilot plant relies on electricity and hydrogen-based heating systems. This dual approach, when combined

with alternative raw materials, holds the potential to sharply reduce -or even completely eliminate- CO₂ emissions from the melting stage. The third element is that of container design. The new glass composition, created without CO₂ emissions, is being tested for its suitability in bottle production. This opens the door to lighter-weight bottles that save material while cutting emissions during transport.

TURNING CHALLENGES INTO OPPORTUNITIES

Transitioning to carbonate-free materials and alternative energy sources is not without obstacles. Such raw materials require significantly higher production temperatures, which place added stress on furnaces, preheaters, and forming machinery. To adapt, the project calls for new refractory materials, modified forming processes, and in some cases, entirely different moulding technologies. Since little research exists on how these alternative materials behave under such demanding conditions, every hurdle also becomes a chance to advance industry knowledge.



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COLLABORATION AS THE FOUNDATION OF SUCCESS

The ZeroCO₂ Glass initiative rests on a strong partnership between IPGR and leading research institutions, particularly two specialist departments at RWTH Aachen University. By uniting expertise from glass production, academic research, and plant engineering, the project creates a unique platform to address challenges head-on. Vetropack, a member of IPGR, plays a particularly active role. Guido Stebner, Chief Technology Officer of Vetropack Group and Chairman of IPGR since 2023, is instrumental in steering collaboration between industrial and research partners. His involvement underscores the importance of linking practical industry knowledge with scientific exploration. With the completion of planning and construction, the pilot facility

is now fully operational. The reference phase has successfully characterised the melting furnace, giving the project team a detailed understanding of the process controls and where adjustments are needed. This achievement clears the way for the next stage: pushing electrification further. Future trials will test higher proportions of electric power in pursuit of the ambitious goals of 50 percent -and potentially even 80 percent- electrification of the melting process.

VETROPACK'S CONTRIBUTION AND OUTLOOK

As one of the most active industrial partners, Vetropack brings decades of experience in glass formulations and process optimisation to the project. This expertise ensures that research findings are firmly grounded in practical realities and

can be translated into solutions that are not only technologically feasible but also economically sustainable. The company also offers valuable perspective on the operational challenges the sector faces daily, helping to shape research in a way that meets industry needs. For Stebner, the role of Chairman of IPGR and CTO of Vetropack is above all about connecting worlds. He has told GMP&A that he envisions himself as a bridge between research institutions and industry - ensuring that innovations move swiftly from the laboratory into production lines. Indeed in his view, aligning scientific insights with practical requirements is the only way to secure meaningful progress toward CO₂-free glass production.

A STEP TOWARD THE FUTURE OF GLASS

The ZeroCO₂ Glass project is more than a research exercise; it represents a clear vision for the industry's sustainable future. By combining alternative raw materials, innovative energy solutions and redesigned products, the initiative is laying the groundwork for a carbon-neutral glass industry. While technical obstacles remain, each challenge brings new learning that strengthens the sector's ability to adapt. With IPGR's coordination, RWTH Aachen's scientific expertise, and the active engagement of industrial players such as Vetropack, the ambition of emission-free glass production is no longer a distant dream. It is a tangible goal - one that is steadily moving closer to reality. ■

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