NEWS RELEASE

Osmoses Secures $11M to Decarbonize Projected $35B Industrial Gas Separation Market with Novel Membrane Technology

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Founded by MIT and Stanford PhDs, the startup offers cost-effective, climate-friendly technology to purify key molecules for alternative energy production

CAMBRIDGE, Mass.--(BUSINESS WIRE)-- **Osmoses**, an industrial separations technology company that purifies gases, the world's smallest molecules, today announced it has raised an oversubscribed $11 million seed round led by **Energy Capital Ventures**. Additional participating investors include **Engine Ventures**, **Fine Structure Ventures**, **New Climate Ventures**, **Collaborative Fund**, **Little Green Bamboo**, **BlindSpot Ventures** and several prominent angel investors, including **Martin Madaus**, the former CEO of Millipore Corporation. Osmoses will use the funding to develop commercial scale membrane modules for field deployment and establish pilot partnerships.

From L to R: Osmoses Co-founders Katherine Mizrahi Rodriguez, PhD (VP, Engineering); Holden Lai, PhD (Chief Technology Officer); Francesco Maria Benedetti, PhD (CEO); and Zachary P. Smith, PhD (Associate Professor, MIT Department of Chemical Engineering). (Photo: Business Wire)

Gas molecules like hydrogen, biomethane, and oxygen are essential ingredients for alternative, low-carbon energy production. Because these gases don't naturally occur in a form pure enough for direct use, they must first be separated; yet, their size and volatility makes doing so extremely difficult, energy-intense, and expensive. Today's industrial separation processes, including cryogenic processes, distillation, and solvent absorption, account for **15% of the world's energy consumption**. CO2 emissions from energy combustion and industrial processes accounted for **89% of energy-related greenhouse gas** emissions in 2022. Membrane technology, which operates as molecular filters to separate gas molecules from one another, has the potential to reduce energy consumption, but

widespread implementation remains limited due to product loss and high operating costs.

Osmoses has developed a patented novel membrane technology that purifies gas molecules with unprecedented flux and selectivity, meaning lower capital requirements and operating costs for customers, with a significantly smaller physical footprint than today's traditional separation processes – all while reducing industrial energy consumption by up to 90%. Published in **Science Magazine in 2022**, Osmoses' breakthrough family of polymer materials is capable of changing the paradigm around membranes for gas molecules, delivering unprecedented performance against conventional materials. In some applications involving hydrogen purification, Osmoses' solution can deliver up to 40% higher product recoveries at a fraction of the cost and over 50% reduction in footprint. Osmoses can also power profitable hybrid separation system designs for low feed concentrations such as those in hydrogen de-blending and helium recovery.

"Solving the challenges of global decarbonization and enabling the energy transition isn't possible without changing how industry separates gases. Low-carbon hydrogen and biomethane are energy vectors that can help us achieve a cleaner future, but we need a more cost-effective, climate-friendly process for accessing these precious gas molecules," said **Francesco Maria Benedetti**, co-founder and CEO of Osmoses. "Osmoses' cutting-edge membrane technology can reduce the impact of gas separations on the environment while also increasing the economic incentive for end-users and positively impact communities disproportionately affected by climate change. By beginning to commercialize our platform, we'll enable more organizations across the globe to hit their net-zero goals and eliminate energy waste with our transformative molecular separation technology."

In addition to decarbonizing production and distribution of low-carbon molecules, Osmoses has demonstrated potential to decarbonize numerous applications within the gas separation industry, including oxygen generation, helium harvesting, refrigerant reuse, and carbon capture. Osmoses' polymer material platform aims to supercharge a $15 billion gas separations industry – already expected to grow to $35 billion by 2030.1

"Osmoses is creating a future where separation isn't a bottleneck to any industrial process, and their membrane platform is an unprecedented technology that can play a major role in the decarbonization of gas production and distribution," said **Vic Pascucci**, Managing General Partner and co-founder at Energy Capital Ventures. "The company has an incredible opportunity to disrupt multi-billion dollar markets worldwide and accelerate the adoption of alternative energy sources with lower environmental impact, and we couldn't be more thrilled to support them in their next phase of growth."

In addition to its venture capital funding, Osmoses recently received **a $1.5 million grant from the U.S. Department of Energy** (DOE), as well as additional grant support from ARPA-E and NSF, among other organizations. The seed investment also comes at a time when many federal and state financial incentives for energy transition projects are coming to bear. The primary metric the Inflation Reduction Act (IRA) uses to assess the impact of

producing and distributing gas molecules like hydrogen is the carbon intensity, which membranes are uniquely positioned to reduce.

“This funding propels Osmoses toward commercialization, getting first products into the hands of key partners and scaling the team to deliver on its ambitious goal of playing a foundational role in decarbonizing heavy industry,” said Michael Kearney, Partner at Engine Ventures.

In the coming months, Osmoses will double its full-time employee headcount, increase its pilot programs with chemical and petrochemical companies, utilities, and alternative energy companies, and develop partnerships with engineering and manufacturing firms. For more information on Osmoses or to apply to one of its open positions, visit **https://osmoses.com/**.

About Osmoses

Osmoses is an industrial separations company with a novel membrane technology that purifies gases, the world’s smallest molecules, with unprecedented performance and efficiency. Founded in 2021 and spun out of MIT, the company’s breakthrough polymer platform is reducing the energy and capital needed to drive global energy transition. For more information, visit **https://osmoses.com/** or follow the company on **LinkedIn**.

About Energy Capital Ventures

Energy Capital Ventures (ECV) is the only early-stage venture capital firm dedicated to the sustainability, resilience, and digital transformation of the natural gas industry. In addition to this unique focus that champions innovation in green molecules™, ECV further differentiates itself with a customized engagement and deep integration with its strategic limited partners. This model empowers Energy Capital Ventures to provide a platform for innovation so that the startup ecosystem and natural gas utilities can collaborate on technologies that enable clean, safe, reliable, cost-effective energy. Learn more at **www.energycapitalventures.com**

About Engine Ventures

Engine Ventures is a venture capital firm investing in the next generation of Tough Tech founders: providing capital, operational expertise, and a powerful academic, commercial, and governmental network to build and scale companies unlocking massive opportunities in climate change, human health, and advanced systems. Visit **engineventures.com** to learn more.

1Market analysis excludes hydrogen distribution, oxygen generation, refrigerant reuse and helium harvesting. Methane: Technavio reports, Gas Separation Membrane Market – Forecast and Analysis 2021-2025. The

Encyclopedia of Membrane Science and Technology (2013). 2022 extrapolated based on natural gas production increase reported by reported by EIA

Biomethane: BCC publishing, Biogas upgrading: Technologies and global markets, Feb 2023 - report code EGY086D.

Hydrogen: BCC Publishing, Global Hydrogen Economy: Merchant Hydrogen and Hydrogen Purification Technologies, 2019.

Carbon capture: BCC Publishing, Carbon Capture, Utilization & Storage Technologies, 2022.

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Source: Osmoses