

CARBON CAPTURE NEWSLETTER



HIGHLIGHTS

The newsletter is compiled by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon capture.

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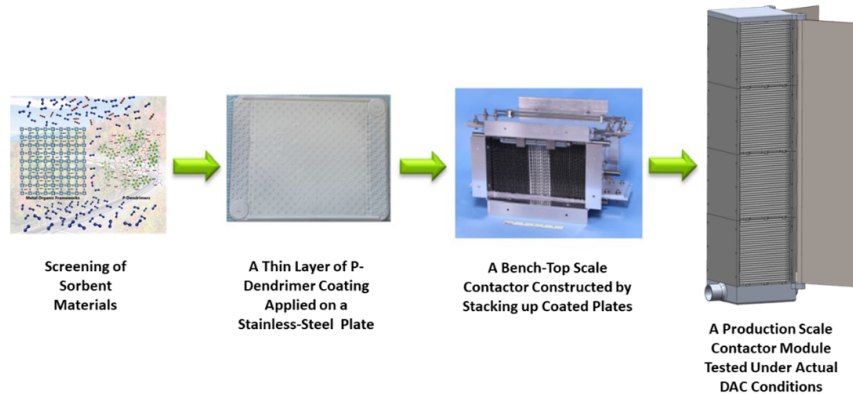
Carbon Capture Solvent Technology to be Tested at World's Largest Test Facility

An advanced solvent for post-combustion carbon capture developed through a partnership involving the University of Texas at Austin (UT Austin) and Honeywell is set for engineering-scale testing in October at the Technology Centre Mongstad (TCM), the world's largest carbon capture test facility located in western Norway. The new technology is an advanced solvent designed to capture carbon dioxide (CO₂) found in flue gases generated from power, steel, cement and other industrial plants. The technology is the product of a multiyear cooperative agreement that was supported by the U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM) and managed by the National Energy Technology Laboratory (NETL). In the technology to be tested, CO₂ is absorbed into an amine solvent and then sent to a stripper where it is separated from the solvent. This CO₂ would then be compressed for geologic storage or used for other purposes. The technology is designed to be retrofitted within existing plants or included as part of a new installation.

Interagency News and Updates

NETL-Managed Projects Support DAC Technology Development

A novel direct air capture (DAC) technology is being developed by Research Triangle Institute (RTI) International with funding and management support provided by NETL on behalf of FECM. Through three collaborative research and development (R&D) projects, RTI selected a DAC sorbent material, completed initial testing of their air contactor design, and is now designing an integrated DAC process for field testing. A follow-on project enabled the design and testing of RTI's bench-scale DAC contactor that was optimized for wind-driven operation using the high-performance, high-durability P-dendrimer sorbent in partnership with Creare.



DOE Invests in Tackling Climate Change by Removing Carbon from the Atmosphere

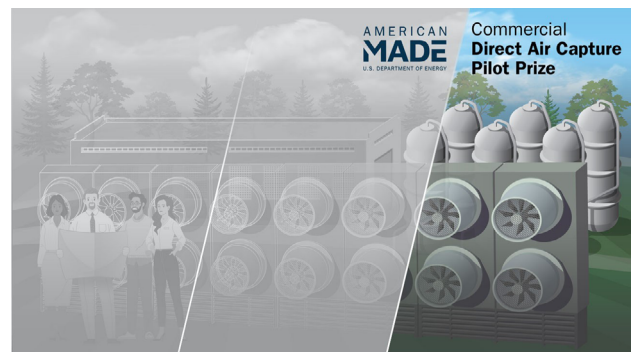
FECM, with DOE's Hydrogen Fuel Cell Technologies Office (HFTO), announced more than \$58.5 million in federal funding



for 11 projects to help develop a commercially viable carbon dioxide removal (CDR) industry in the United States. The funding will support pilot projects and testing facilities to demonstrate and scale CDR technologies that reduce CO₂ pollution by removing it directly from the atmosphere. HFTO will manage one project that supports small-scale biomass carbon removal and storage technology. NETL, under the purview of FECM, will manage the remaining 10 projects. (Four of these projects will also support small-scale biomass carbon removal and storage technology.)

Funding Notice: Commercial DAC Pilot Prize

FECM announced up to \$52.5 million to advance CDR technologies that reduce legacy CO₂ pollution by removing it directly from the atmosphere to counter-balance emissions from hard-to-abate sectors, such as aviation and shipping. The American-Made Commercial DAC Pilot Prize, funded by the BIL, will support the development and deployment of DAC pilot projects that have demonstrated commercial readiness. This will help advance the industry, create meaningful and well-paying jobs, increase private investment, and help deliver the benefits of climate investments

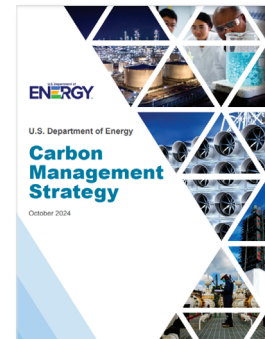


to the communities that host clean energy projects. The Commercial DAC Pilot Prize will provide capital to support DAC pilots that have exceeded the technology readiness levels eligible for Pre-Commercial DAC Prizes but are not sufficiently demonstrated or commercially de-risked enough to be deployed in the Regional DAC Hubs Program.

Interagency News and Updates (continued)

DOE's Carbon Management Strategy

DOE's "Carbon Management Strategy" report provides a comprehensive roadmap for the remainder of the decade that outlines the diverse tools and approaches DOE will use to develop and deploy carbon management solutions. The strategy is intended to inform a wide range of stakeholders about DOE's carbon management programmatic priorities in the coming years. Further, it is designed to help stakeholders involved in carbon management to better understand how to engage with DOE based on their needs for support in the coming years. DOE posted this report for the first time as a draft for public comment in October. Comments can be submitted to carbonmanagementstrategy@hq.doe.gov by December 10, 2024.



OCED Issues NOI to Fund Transformational DAC Technologies and Remove Legacy CO₂

OCED issued an NOI to fund up to \$1.8 billion for the design, construction and operation of mid- and large-scale commercial DAC facilities and infrastructure scaling platforms. This funding supports a broad range of promising DAC technologies on their path to commercialization and deployment that can spur the growth of additional DAC hubs. As part of the Regional DAC Hubs Program, this funding will help support an ecosystem of projects that aim to remove legacy CO₂ from the atmosphere.



OCED Announces NOI to Fund Transformational Emissions Reducing Technologies to Support Our Clean Energy Future

DOE's Office of Clean Energy Demonstrations (OCED) issued an NOI to fund up to \$1.3 billion to catalyze investments in transformative carbon capture, utilization and storage (CCUS) technologies. This funding will help create good-paying jobs; reduce pollution to deliver healthier communities; and ensure America's global leadership in developing the cost-effective, emissions-reducing technologies needed to decarbonize the nation's electricity generation and hard-to-decarbonize industrial sectors. OCED, in collaboration with FECM, anticipates offering funding in the following three topic areas: Carbon Capture Demonstration Projects, Carbon Capture Large-Scale Pilot Projects, and Carbon Capture Demonstration Projects Program — Infrastructure Planning and Design.

NOI to Issue University Training and Research for FECM FOA

DOE released a Notice of Intent (NOI) to issue DE-FOA-0003215, "University Training and Research for Fossil Energy and Carbon Management." The University Training and Research Program, sponsored by FECM and administered by NETL, has the following primary mission objectives: (1) educate and train the next generation of engineers and scientists; (2) support novel, early-stage research at U.S. colleges and universities; (3) increase R&D opportunities for underrepresented and structurally marginalized communities; (4) ensure that students are being equipped with cutting-edge, translatable skill sets that will allow them to contribute to the U.S. workforce and greater economy over the course of a longstanding and enduring career.

Interagency News and Updates (continued)

DOE Plans to Continue Investing in Carbon Dioxide Transport FEED Studies

FECM anticipates a funding opportunity announcement (FOA) for projects that would receive funding from the Bipartisan Infrastructure Law (BIL) to conduct front-end engineering design (FEED) studies that support and accelerate the planning for CO₂ transport from anthropogenic sources to CO₂ conversion or secure geologic storage locations. Many CO₂ emitters (such as fossil energy power plants, ethanol facilities and other industrial operations) are not located near suitable geologic CO₂ storage sites. A CO₂ transport network is required to connect these CO₂ sources to locations that will use the CO₂ as a feedstock to manufacture chemicals and other products or to permanently store CO₂ in targeted, suitable subsurface geologic formations.



Seventeen NETL Researchers Recognized in Stanford University's Annual Top 2% of Scientists Worldwide List

An [analysis](#) published by Stanford University included 24 current and former NETL researchers in the top 2% of global scientists, demonstrating the level of talent and expertise NETL is bringing to bear on the nation's decarbonization goals. The analysis comprised lists according to single-year impact and career-long impact. Current and former NETL researchers listed in the top 2% for single-year impact were Dominic Alfonso, Ray Boswell, Michael Buric, Yuhua Duan, Michael C. Gao, Angela L. Goodman, Jeffrey Hawk, Gordon R. Holcomb, Douglas Kauffman, Yueh Lin Lee, Ping Lu, Mehrdad Massoudi, Ali A. Rownaghi, Wissam Saidi, Yongkoo Seol, Ranjani Siriwardane and Dan Sorescu. Current and former NETL researchers listed in the top 2% for career-long impact were Dominic Alfonso, David E. Alman, Sofiane Benyahia, Ray Boswell, Ronald Breault, Ömer N. Doğan, Yuhua Duan, Michael C. Gao, Randall Gemmen, Angela L. Goodman, Jeffrey Hawk, Gordon R. Holcomb, Ping Lu, Mehrdad Massoudi, James Rawers, Wissam Saidi, Ranjani Siriwardane, D.H. Smith and Dan Sorescu.



FECM Assistant Secretary Delivered Keynote Address at CO₂NNECT 2024 Conference

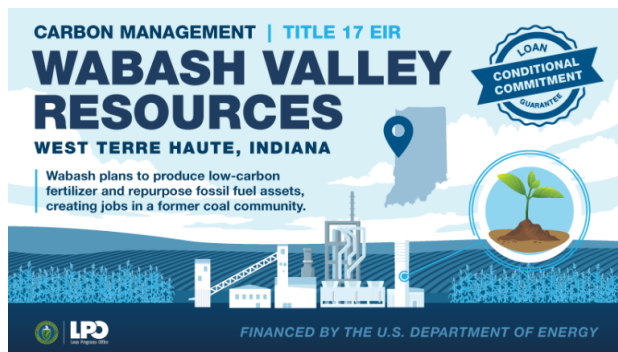
FECM Assistant Secretary Brad Crabtree delivered the keynote address at the CO₂NNECT 2024 Conference in Keystone, Colorado, Sept. 30, 2024. Assistant Secretary Crabtree highlighted the important role carbon management has to play in the future economy, stating that DOE and FECM “have undoubtedly made huge strides in terms of technology development, the number of operating projects and those in the project development pipeline.” He closed by mentioning that the United States has “the most robust policy framework in the world to develop and deploy carbon capture, removal, conversion, transport and storage across the whole value chain, economy-wide and at climate scale ... in a way that delivers significant economic, jobs and environmental benefits to communities across our nation.”



Interagency News and Updates (continued)

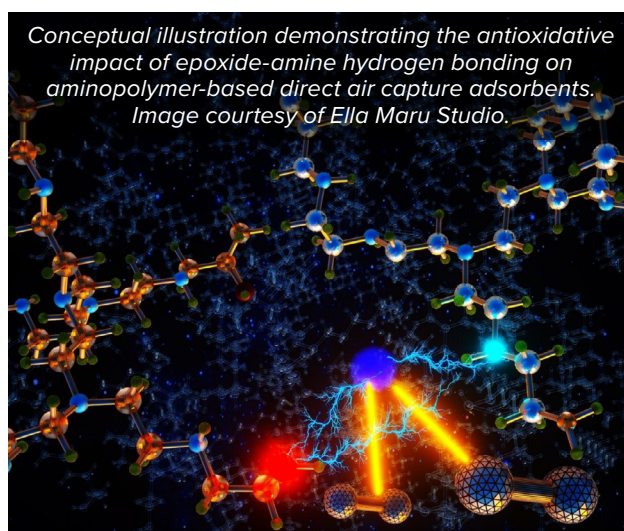
LPO Announces Conditional Commitment to Wabash Valley Resources to Repurpose Fossil Fuel Infrastructure to Produce Low-Carbon Ammonia for Midwest Farmers

DOE's Loan Programs Office (LPO) announced a conditional commitment for a loan guarantee of up to \$1.559 billion to Wabash Valley Resources LLC. The loan guarantee would help finance a commercial-scale waste-to-ammonia production facility using carbon capture and storage (CCS) technology in West Terre Haute, Indiana. The project, which will have the potential to be the world's first carbon-negative ammonia production facility, would repurpose an industrial gasifier to utilize petroleum coke while permanently storing CO₂ to produce 500,000 metric tons of anhydrous ammonia annually. The project would play a critical role in securing domestic fertilizer supply for the region commonly known as the Corn Belt, contributing to both food security and climate goals.



New Chemistry Leads to More Robust Carbon Capture Materials

Lawrence Livermore National Laboratory (LLNL) scientists uncovered how some carbon capture materials have improved lifetime compared to others. However, a persistent challenge has been the waning CO₂-capturing capability of these carbon-absorbing agents over time that is caused by degradation. A collaborative team from LLNL and the National Renewable Energy Laboratory (NREL) delved into the concept of epoxide-functionalization, a method designed to counteract the diminishing effectiveness of these materials. The research is featured on the cover of *Chemical Communications*.



Insights from the Appalachia Regional Deploy Dialogue: Advancing Industrial Decarbonization

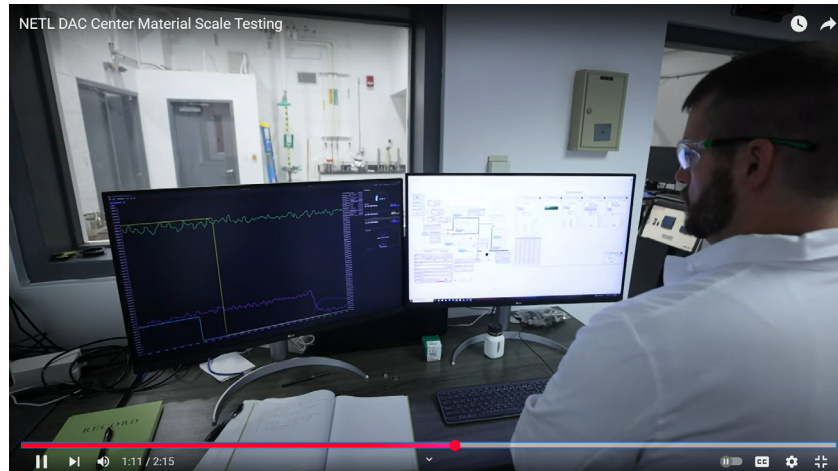
FECM, in collaboration with the Office of Technology Transitions and LPO, hosted an Appalachia Regional Deploy Dialogue focused on industrial decarbonization. Held during the 2024 FECM-NETL Carbon Management Research Project Review Meeting, or Carbon Management Week, in Pittsburgh, Pennsylvania, this dialogue brought together public and private sector stakeholders to discuss the deployment of CCS technologies in Appalachia's industries, including steel, cement, chemicals, pulp and paper, glass, and lime. Regional industrial and energy companies also provided insights into key barriers and potential solutions for advancing industrial carbon capture in Appalachia.



Interagency News and Updates (continued)

Video: NETL DAC Center Material-Scale Testing

A short video now available summarizes the NETL DAC Center's material-scale testing; the video first introduces the concept of DAC and then gives a high-level overview of the testing and results-sharing process.



DAC Explained

FECM's "DAC Explained" fact sheet introduces the concept of DAC along with the two primary technical approaches to DAC that are being deployed today: solid sorbent systems and liquid solvent systems.



DOE STEM Portal

DOE is building pathways for a diverse workforce to pursue careers in science, technology, engineering and math (STEM). DOE seeks to engage learners at all levels to promote STEM and energy literacy and to attract, inspire and develop a STEM identity and a sense of belonging in STEM. DOE is committed to promoting and supporting people from all backgrounds and perspectives, including individuals and communities that have been historically underrepresented in STEM fields and activities at DOE.



Bipartisan Infrastructure Law Hub

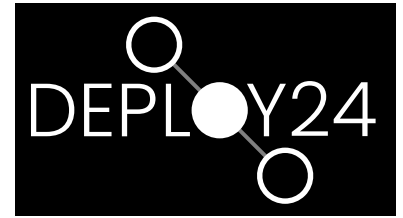
The BIL represents the most dramatic changes to DOE since its founding in 1977. The BIL is standing up 60 new DOE programs, including 16 demonstration and 32 deployment programs, and is expanding funding for 12 existing research, development, demonstration and deployment programs. NETL's BIL Hub provides information on the BIL, including links to the Guidebook, DOE's Clean Energy Corps, DOE's Applicant Portal and DOE's Grid Resilience Program, as well as information on solicitations and funding opportunities.



U.S. and International Events

Conference: Deploy24

Hosted by DOE, Demonstrate Deploy Decarbonize 2024 (Deploy24) will be held Dec. 4–5, 2024, in Washington, D.C. Deploy24 will bring together decision-makers from the private sector, government and the broader ecosystem dedicated to accelerating the deployment of critical energy and decarbonization technologies in the United States. The conference gathers fellow clean energy leaders from across the country to discuss how to effectively and equitably use federal and private sector investments to strengthen the energy system and secure a clean energy future. Register [here](#).



Midland CO₂ Conference

The CO₂ Conference, to be held Dec. 9–12, 2024, in Midland, Texas, attracts CO₂ leaders in the industry and provides a forum for highlighting the best practices the industry utilizes in all CO₂ applications. The agenda will include the interrelated subjects of CO₂ enhanced oil recovery, CCUS/carbon management, CO₂ reservoir cyclic injection and residual oil zone exploitation.



CLIMIT Summit 2025

CLIMIT Summit 2025, to be held Feb. 25–27, 2025, in Larvik, Norway, will focus on international collaboration and its impact on the development of CCS and CDR globally. Day one of the summit will be the international CDR conference in partnership with Mission Innovation CDR, with public and private-sector representatives from the United States, Canada, the European Union and the United Kingdom, among others. During the conference, there will also be a separate session on the Mission Innovation CDR's student initiative—the Student Monitoring and Reporting Technology for Carbon Dioxide Removal (SMART-CDR) Competition — where the final student teams will present their innovative ideas to the audience, who will vote on the best ideas. More details are available [here](#).



POWERGEN 2025

POWERGEN 2025, to be held Feb. 11–13, 2025, in Dallas, Texas, serves as a business and networking hub for 8,000 electricity generators, utilities and solution-providers engaged in power generation—providing a platform to discuss in-depth challenges faced by all energy stakeholders and helping them find a path from where the industry is now to where the new emerging and leading trends will take it.



CCUS 2025

CCUS, to be held March 3–5, 2025, in Houston, Texas, highlights current CCUS work and addresses related challenges. Keynote speakers and lunch panels will drive the discussions of the future of energy. Work presented at the event will demonstrate the ongoing need for skilled petroleum geologists, geophysicists and engineers to help define the future of carbon management.



U.S. and International Events (continued)

Co-creating Sustainable Carbon Management Solutions for a Thriving Climate



Carbon Capture, Utilization and Storage
Gordon Research Conference

Co-creating Sustainable Carbon Management Solutions for a Thriving Climate

Co-creating Sustainable Carbon Management Solutions for a Thriving Climate, to be held April 6–11, 2025, in Ventura, California, is an international scientific conference focused on advancing the frontiers of science through the presentation of cutting-edge and unpublished research. In addition to premier talks, the conference has designated time for poster sessions from individuals of all career stages.

Carbon Capture & Storage Summit

The CCS Summit, to be held June 9–11, 2025, in Omaha, Nebraska, offers attendees a comprehensive look at the economics of CCS, the infrastructure required to make it possible, and the financial and marketplace impacts to participating producers.



Employment Opportunities

Explore Career Opportunities with FECM

FECM is looking for enthusiastic, driven professionals to join the team and help define the future of energy. Learn more about FECM's [Workforce Programs](#) and sign up for FECM career alerts to receive the newest vacancies. Text FECM CAREERS to 468311 to receive text message alerts or subscribe [here](#).

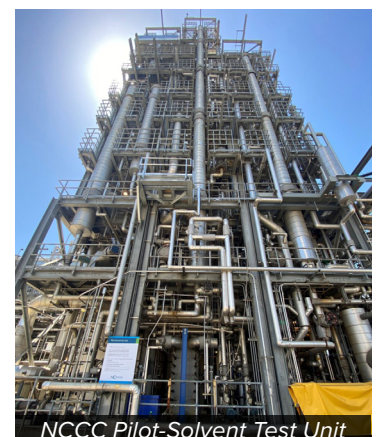
Explore Career Opportunities at NETL

At the core of NETL's success is its commitment to hiring the right people for the right positions. DOE's only government-owned and government-operated national laboratory offers exciting federal careers in research and engineering, technical project management, procurement, finance and budget, legal, and administrative support. Learn more at [NETL Careers](#).

Business and Industry News

EPRI and Collaborators to Begin Water-Lean Solvent Testing at NCCC

The Electric Power Research Institute (EPRI) and a research team including Pacific Northwest National Laboratory (PNNL), RTI and the National Carbon Capture Center (NCCC) recently began engineering-scale testing in NCCC's Pilot Solvent Test Unit of a water-lean solvent for postcombustion carbon capture. During the past few years, PNNL has been refining water-lean solvent classes and optimizing any physical and thermodynamic properties that limit its performance. PNNL's solvent, N-(2-ethoxyethyl)-3-morpholinopropan-1-amine (EEMPA), has been tested at the lab and bench scale at RTI, confirming its potential for good thermal performance.



NCCC Pilot-Solvent Test Unit

Business and Industry News (continued)

MTR Carbon Capture Announces Completion of the World's Largest Membrane-Based Carbon Capture Plant

Membrane Technology and Research (MTR) Carbon Capture announced the mechanical completion of a carbon capture plant at the Wyoming Integrated Test Center (ITC) in Gillette, Wyoming. The plant will capture up to 150 metric tons of CO₂ per day from Basin Electric's Dry Fork Station coal-fired power plant. This system will be the first commercial-scale membrane capture plant to be put into operation when it starts later this year. The MTR Carbon Capture system at the Wyoming ITC is part of DOE's large-scale pilot Carbon Capture Program and is funded through grant DE-FE0031587. This program supports the development of key technologies that will significantly improve the economics and environmental performance of point-source carbon capture.



MTR and DOE personnel, Gillette WY, September 2024

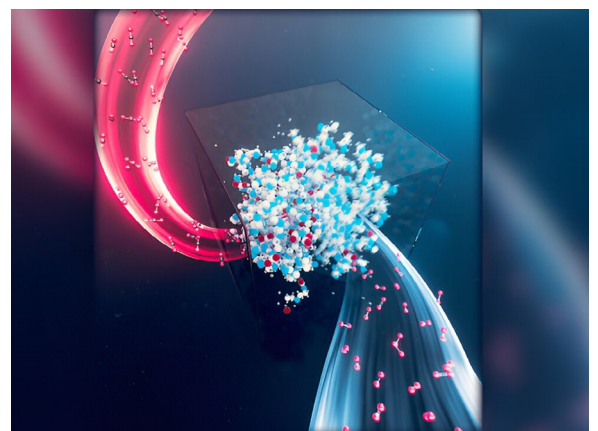
NTEC Gains DOE Grant for Power Plant Carbon Capture Feasibility Study

OCED awarded Navajo Transitional Energy Company (NTEC) a grant worth \$6.55 million for a FEED study to evaluate the feasibility of adding CCS to the coal-fired Four Corners Power Plant in New Mexico. The addition will not only help remove more than 95% of CO₂ emissions at the 1.5-gigawatt power plant, but also protect more than 600 jobs on the Navajo Nation and preserve \$183 million per year in total economic impact to the region, while ensuring the reliability of the regional power grid. NTEC aims to use amine-based, postcombustion carbon capture technology to remove CO₂ from flue gas and extend the life of the plant beyond 2031.



New Research Could Extend the Lifetime of Key Carbon-Capture Materials

In collaboration with the Georgia Institute of Technology, researchers at LLNL published a study looking at atmospheric components in the design of DAC processes and materials. The research team investigated the role of CO₂ in the oxidative degradation process of amine-based sorbents, reconciling conflicting data in existing literature. The study reveals that CO₂ exerts a nonmonotonic effect on the oxidation kinetics of poly(ethylenimine) sorbents, with its impact varying significantly depending on temperature and CO₂ concentration. The study offers practical implications for the future of DAC technology. By identifying polymer side chain mobility and the presence of acidic environments as major factors accelerating oxidation, the research suggests new strategies to enhance sorbent longevity.



Atomistic simulations, machine learning potential and accelerated degradation experiments reveal the complex role of CO₂ in the oxidation kinetics of amine-functional sorbents for carbon capture.

Credit: Illustration concept: Sichi Li/LLNL; Illustration: Jacob Long and Adam Samuel Connell/LLNL

Publications

Carbon management technology pathways for reaching a U.S. Economy-Wide net-Zero emissions goal

Matthew Binsted, Ellie Lochner, Jae Edmonds, José Benitez, John Bistline, Morgan Browning, Francisco De La Chesnaye, Jay Fuhrman, Leonard Göke, Gokul Iyer, Kathleen Kennedy, Page Kyle, Carol Lenox, Haewon McJeon, Kowan O'Keefe, Patrick O'Rourke, Amogh Prabhu, Ron Sands, Luis Sarmiento, Sharon Showalter, Nadja Victor, Frances Wood, Sha Yu, Mei Yuan, *Energy and Climate Change*, Volume 5, December 2024. (Subscription may be required.)



Performance and economic viability assessment of a novel CO₂ adsorbent for manufacturing and integration with coal power plants

Abdelmalek Bellal, Xiaodong Hou, Junior Nasah, Johannes Van der Watt, Daniel Laudal, James Hoffman, *Chemical Engineering Journal*, Volume 498, Oct. 15, 2024. (Subscription may be required.)



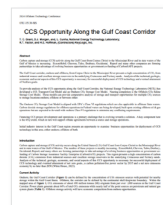
The Adverse Effect of Polyelectrolyte Complexation on the CO₂ Permeability of Polyvinylamine Copolymers

James S. Baker, Victor A. Kusuma, Zi Tong, David P. Hopkinson, *ACS Applied Engineering Materials*, Volume 2, Issue 5, April 30, 2024. (Subscription may be required.)



CCS Opportunity Along the Gulf Coast Corridor

Timothy Grant, David Morgan, Luciane Cunha, Taylor Vactor, *Offshore Technology Conference*, Houston, Texas, May 2024. (Subscription may be required.)



Strategic Siting of Direct Air Capture Facilities in the United States

Jason Boerst, Ivonne Pena Cabra, Smriti Sharma, Connie Zaremsky, Arun K. S. Iyengar, *Energies* 2024, Volume 17, Issue 15, July 30, 2024.



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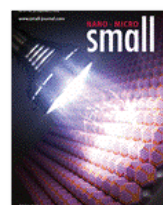
Tuning sorbent properties to reduce the cost of direct air capture

Hannah E. Holmes, Sayan Banerjee, Anthony Wallace, Ryan P. Lively, Christopher W. Jones, Matthew J. Realff, *Energy & Environmental Science*, Issue 13, July 2, 2024.



Ionic Pairs-Engineered Fluorinated Covalent Organic Frameworks Toward Direct Air Capture of CO₂

Liqi Qiu, Ming Lei, Caiqi Wang, Jianzhi Hu, Lilin He, Alexander S. Ivanov, De-en Jiang, Hongfei Lin, Ilja Popovs, Yanpei Song, Juntian Fan, Meijia Li, Shannon M. Mahurin, Zhenzhen Yang, Sheng Dai, *Small*, Volume 20, Issue 36, Sept. 5, 2024. (Subscription may be required.)



A multifunctional rooftop unit for direct air capture

Keju An, Jamieson Brechtel, Stephen Kowalski, Cheng-Min Yang, Michelle K. Kidder, Costas Tsouris, Christopher Janke, Meghan Lamm, Katie Copenhaver, Josh Thompson, Tugba Turnaoglu, Brian Fricke, Kai Li, Xin Sund, Kashif Nawaz, *Environmental Science: Advances*, Issue 6, 2024.



About DOE Carbon Capture:

DOE/NETL is developing the next generation of advanced CO₂ capture technologies through NETL's Point Source Carbon Capture Program (PSCC) and advancing a diverse set of CDR approaches to directly remove CO₂ emissions from the atmosphere through NETL's Carbon Dioxide Removal Program.



The Digital Compendium of Carbon Capture Technology provides a technical summary of the DOE/NETL's Carbon Capture Program, assembling carbon dioxide capture technology research and development (R&D) descriptions in a searchable database.



Carbon Capture Reference Materials

- Point Source Carbon Capture Program Fact Sheet
- Carbon Dioxide Removal Program Fact Sheet
- Carbon Capture Infographics
- Interactive Project Maps: PSCC and CDR
- Compendium of Carbon Capture Technology
- Carbon Dioxide Capture Handbook
- CCSI²
- Systems Analysis
- Conference Proceedings
- Accomplishments Posters: PSCC and CDR

Contact Us

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Program staff are also located in **Houston, Texas** and **Anchorage, Alaska**

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