An ECCSEL ERIC project

Tuesday, April 26th, 2022, 14-15 CET

WEBINAR

Advanced membranes for CO_2 capture

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Speakers

Liyuan Deng – professor in the Department of Chemical Engineering at the Norwegian University of Science and Technology (NTNU)

Matteo Minelli – Associate professor: Alma Mater Studiorum – University of Bologna

Q&A session chaired by **Alberto Pettinau**, Head of Research and Development, Sotacarbo,

WHAT WILL YOU LEARN

Nanomaterials Enhanced Membranes for CO_2 capture: Journey from Lab to Industry

Carbon dioxide capture and utilization (CCU) is a key approach for the innovation and sustainability of the chemical industry. The decarbonization of several manufacture processes can be supported by the reuse of captured CO_2, in a circular economy scenario. In particular, CO_2 can be converted into added-value chemicals, polymeric materials, and fuels which have each a market higher than 1 Mt/y, causing a significant reduction of CO_2 emission.

Polymer-based membranes for carbon capture applications: from size-sieving to facilitated transport

The conversion of captured CO_2 and renewable electricity into green fuels – such as methanol, dimethyl ether, methane, etc. – is gaining interest for its potential contribution to the decarbonization of power generation and several "hard-to-abate" sectors, such as industrial processes and heavy transport. This technology can play a key role to chemically store the overproduction of electricity from non-programmable energy sources (i.e. sun and wind), avoiding stability issues of the electrical grid and allowing a gradual phase-off of the conventional power generation plants from fossil fuels. In parallel, with the rapid development of direct air capture (DAC) technologies, this approach allows the production of fully renewable fuels (especially methanol) that can replace the fossil-derived ones widely used in several industrial sectors and promote the decarbonization of heavy transport (e.g. air transport and shipping), where the dependence from oil-derived fuels is currently deeply rooted.

ECCSEL ERIC (European Research Infrastructure Consortium) was established in June 2017 as a permanent pan-European distributed research infrastructure, with the main objective of enhancing European science, technology development, innovation and education in the field of CCUS, in order to combat climate change.

ECCSELERATE project is aimed at increasing the accessibility to the excellent network of facilities already established in ECCSEL ERIC for a wider user group, part of the research and industrial community.

For further information visit our website

eccsel.org

eccsel.org/about/eccselerate/

KEYNOTE SPEAKERS

Liyuan Deng
is professor in the Department of Chemical Engineering at the Norwegian University of Science and Technology (NTNU) and the head of the membrane research group, MEMFO. Her primary research interests relate to membranes for carbon capture and clean energies. She has 20 years of experience in membrane research, including membrane material development, membrane absorption, membrane process design, and allied modeling and simulations, spanning from lab testing to pilot study and demonstration. She has led many national research projects on developing optimal membranes and membrane processes, including CO_2 capture from various flue gas streams, biogas upgrading, natural gas sweetening, and hydrogen recovery. She has also been involved in several EU projects on new CO_2 capture technologies as work package leader. She has published more than 100 peer-reviewed papers in membrane research and CO_2 separation. She is also a co-inventor of several patents, including two patents that have been licensed to the industry. She is a Member of the Norwegian Academy of Technological Sciences.

Matteo Minelli
is Associate Professor of Chemical Engineering Fundamentals at UniBO, Bologna-IT, at the Department of Civil, Chemical, Environmental and Materials Engineering. He graduated in Chemical Engineering in 2005, and defended his PhD thesis in 2009.
His main scientific interests are related to the analysis of mass transport phenomena in polymers and polymer-based composites from an experimental and modeling point of view. In particular, the focus is on the development and the characterization of gas separation performances of membranes for CO_2/N_2 or CO_2/H_2 separation, in wide temperature and pressure ranges, coupled with the development of thermodynamic and transport modeling approaches to correlate material properties and membrane performances.
He is author of over 100 publications in international peer reviewed journals on membrane science, chemical engineering, polymer technology or thermodynamics with a h-index equal to 24. Referee for a large number of international high IF journals and member of the editorial board of Polymer Testing and Polymers.

WHAT IS CCUS?

Carbon capture, utilisation and storage, or CCUS, is an important emissions reduction approach that can be applied across the energy system, in both power generation and industrial sectors.

CCUS encompasses methods and technologies to remove CO_2 from the flue gas and from the atmosphere, followed by recycling the CO_2 for utilization and determining safe and permanent storage options:

- **Capture** technologies allow the separation of CO_2 from gases produced in electricity generation and industrial processes.
- After capture, carbon dioxide must be **transport**ed to the storage or utilization site. CO_2 is an inert gas and can be easily handled and transported in high-pressure pipelines. Alternatively, it can be transported in industrial tanks by ship, rail and truck.
- There are several possibilities for long-term CO_2 **storage** in safe conditions. Generally, CO_2 is stored in carefully selected geological rock formations that are typically located several kilometres below the earth's surface.
- **Utilization** technologies allow to use CO_2 to make valuable products, such as clean fuels, building materials or consumer goods. A clear example of circular economy, where the CO_2 becomes a raw material rather than a waste by-product.