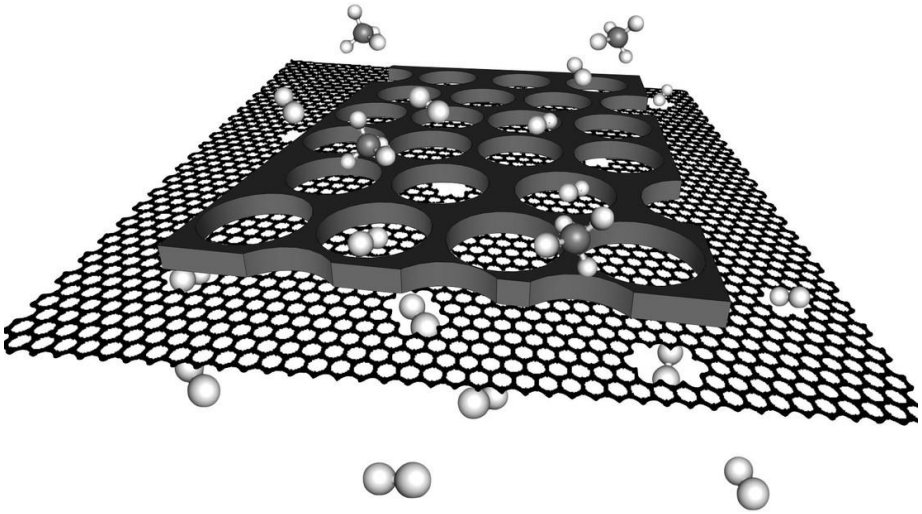
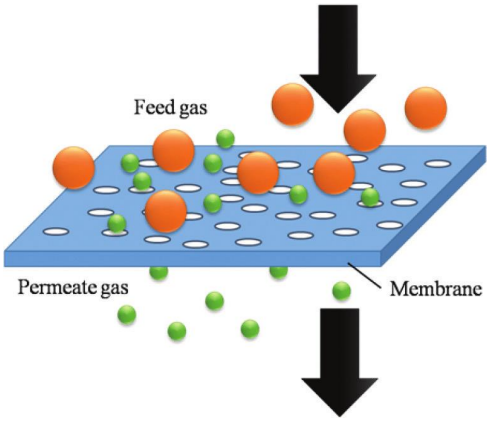
EPFL Carbon Team

Title of the project : Improve the protocol for preparing graphene membranes



Context

For several years, the Laboratory of Advanced Separations, abbreviated as LAS, has been engaged in the development of a technology designed to effectively separate carbon dioxide from a gas stream. Referred to as a graphene membrane, this innovation consists of a sheet of graphene – a Nobel Prize-winning material – with chemically formed holes on its surface. The diameter of these holes can be manipulated to selectively allow only CO2 molecules, which are smaller than N2 and O2, to pass through the graphene sheet. Following this, the graphene sheet is attached to a porous polymeric support, providing mechanical strength to the graphene sheet. Together, they constitute what is referred to as a membrane.



As of today, the Laboratory of Advanced Separations can produce a 25cm x 10cm membrane. Nevertheless, they are continually striving to improve their performance. One of the present challenges involves identifying ways to enhance the polymeric support, given that the current one restricts CO2 flux. They envision that utilizing a COF (Covalent Organic Framework) along with the incorporation of CNTs (Carbon NanoTubes) will significantly surpass the capabilities of the existing polymeric support.

Description

The development of the membrane initiates with an available graphene sample from the laboratory. You will start by preparing small coupons, initially with graphene layers atop Cu layers, gradually progressing to larger coupons, ultimately achieving a surface area of 10cm x 25cm. To form a COF film, you will coat this graphene with a solution containing COF monomers, followed by drying the solution inside an oven. It's important to note that you will receive training from a lab member, aiming for your independence. Atop this film, you will apply a CNT solution to enhance its strength. Finally, you will conduct membrane testing using the permeation setup of the lab.

Requirements

- Knowledge in chemistry and material sciences.
- Experience in the lab.

Tasks

- Get training on membrane preparation.
- Improve the protocol and test the capacity of the new membrane to capture CO_2.

Contact

Supervising lab: LAS, Prof. Kumar Agrawal
Student supervisor: Louis Saix (louis.saix@epfl.ch)

Remarks

Project location: Sion.
The project can accommodate a maximum of 5 students so that more progress is achieved in one semester.