

ICB seminar series 2021/22 chairman: Prof. Dr. Paolo Arosio

CHEMISTRY & ENGINEERING OF TWO-DIMENSIONAL MATERIALS FOR ENERGY-EFFICIENT MOLECULAR SEPARATION

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Abstract: High-performance membranes play a crucial role in improving the energyefficiency of separation processes and reducing the carbon emission. In this context, I will present our activities on the chemistry and engineering of two-dimensional materials at the angstrom length scale using top-down and bottom-up synthetic strategies. I will discuss strategies for the incorporation of vacancy defects in graphene to achieve a molecular differentiation resolution of 0.3 Å with application in post-combustion carbon capture. I will discuss molecular transport engineering toolkit that has led to a record-high carbon capture performance. I will describe the ongoing pilot plant demonstrator project for the postcombustion capture. Finally, I will discuss lego-like assembly of zeolite nanosheets for facile fabrication of zeolitic membranes for high-temperature H2/CO2 separation.

Bio: Kumar is an Assistant Professor at the Institute of Chemical Sciences and Engineering at EPFL. He received his undergraduate degree in Chemical Engineering from IIT Bombay (India). After a short stint at the global R&D division of Procter & Gamble, he obtained his PhD in Chemical Engineering from the University of Minnesota. He is the recipient of AIChE Separation Division FRI/John G. Kunesh Award, NAMS Young Membrane Scientist Award, ERC Council Starting Grant, among others.



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