

EuroTech Seminar

Chemistry & engineering of two-dimensional materials for energy-efficient molecular separation



12 May 2021

15:00-16:00 CET

Zoom link:

<https://us02web.zoom.us/j/85946790723>

**Prof. Kumar Varoon
Agrawal**

GAZNAT Chair of Advanced Separations, École Polytechnique Fédérale de Lausanne

I will present our work on the synthesis of nanoporous two-dimensional materials such as graphene, graphitic carbon nitrides and zeolite precursors using a number of top-down and bottom-up synthetic strategies. In case of graphene, I will discuss defect nucleation and expansion strategies that allow incorporation of vacancy defects (nanopores) at a high density but with a narrow pore-size-distribution with a resolution of 0.3 Å for molecular differentiation, leading to realization of record-high performance in post-combustion carbon capture. I will discuss mechanical reinforcement strategies that allows one to scale-up nanoporous single-layer graphene membranes for gas separation which has led to a pilot plant demonstration project. Finally, I will discuss synthesis and tuning of gas transport pathways from nanoporous two-dimensional nanosheets and their films that allow facile fabrication of membranes for pre-combustion carbon capture.