## CHEM2DMAC

## 2D materials-based intelligent membranes

## Prof. Rahul Raveendran Nair

National Graphene Institute and Department of Chemical Engineering, University of Manchester, Manchester, UK

rahul@manchester.ac.uk

Permeation through nanometre-pore materials has been attracting unwavering interest due to fundamental differences in governing mechanisms at macroscopic and molecular scales, the importance of water permeation in living systems, and relevance for filtration and separation techniques. Latest advances in the fabrication of artificial channels and membranes using two-dimensional (2D) materials have enabled the prospect of understanding the nanoscale and sub-nm scale permeation behavior of water and ions extensively. In particular, several laminate membranes made up of 2D materials show unique permeation properties such as ultrafast permeation of water and molecular sieving. In my talk, I will discuss our recent results on controlling molecular transport through various 2D materials-based membranes by an external parameter and will discuss the prospect of developing next-generation intelligent membranes based on 2D materials.

## References

- [1] Nair et al. Science 335, 442 (2012).
- [2] Joshi et al. Science, 343, 752 (2014).
- [3] Su et al. Nature Communications 5, 4843 (2014).
- [4] J. Abraham et al. Nature Nanotechnology 12, 546-550 (2017).
- [5] Q. Yang et al. Nature Materials 16, 1198 (2017).
- [6] A Esfandiar et al. Science 358, 511-513 (2017).
- [7] K. G. Zhou et al. Nature 559, 236-240 (2018).
- [8] Huang et al. Nature Communications 11, 1097 (2020).
- [9] Zou et al. Nature Materials 20, 1677-1682 (2021).