Graphene Membranes for Pressure and Gas Sensors

Peter Steeneken
Precision and Microsystems Engineering department and Kavli Institute of Nanoscience, Delft University of Technology, Mekelweg 2, Delft, The Netherlands
P.G.Steeneken@tudelft.nl

Suspended layers of graphene are the thinnest membranes known to mankind. This results in very high flexibility, surface-to-volume ratio and strength, while at the same time having a very low mass. These features have the potential to extend the performance of current pressure and gas sensors, offering higher sensitivity and dynamic range, and also enabling new sensing modalities. In this presentation, recent advances in using graphene for pressure and gas sensing applications will be shown, and an overview [1] of the performance and challenges in implementing various pressure and gas sensing concepts will be given with a focus on innovative concepts like squeeze-film pressure sensing (Fig. 1, [2]) and permeation-based gas sensing (Fig. 2, [3]).

REFERENCES

[1] M.C. Lemme *et al.*, Nanoelectromechanical Sensors Based on Suspended 2D Materials, *Research (2020), p. 8748602*.
[2] R.J. Dolleman *et al.*, Graphene squeeze-film pressure sensors, *Nano Letters 16 (2016), p. 568-571.*
[3] I.E. Rosłoń *et al.*, High-frequency gas effusion through nanopores in suspended graphene, *Nature Communications, 11 (2020), p. 1-6.*

FIGURES

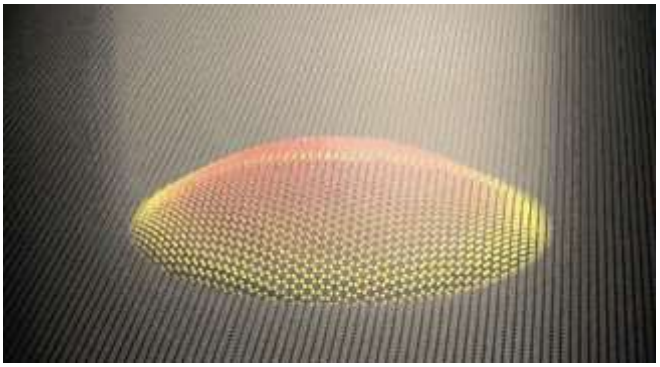

Figure 1: Graphene membrane pressure sensor with optical readout [2]

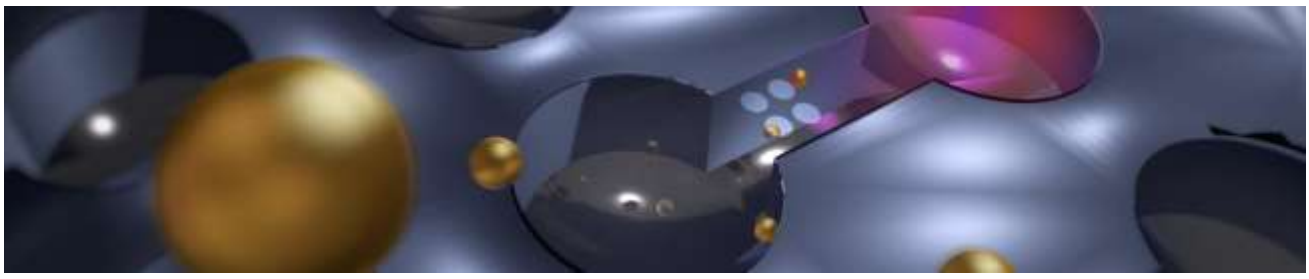

Figure 2: Nanopores are engineered in graphene membranes to enable permeation-based gas sensors [3]