

# Recent Developments using GraphAir technologies (Membranes and Terahertz Devices)

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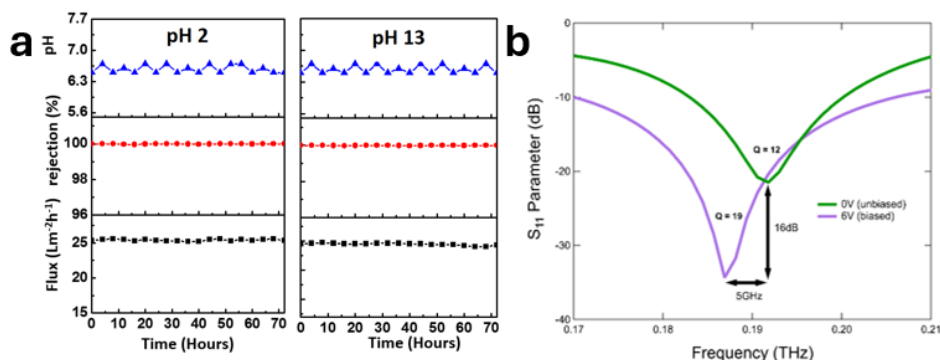
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CSIRO has been developing its own graphene thin films prepared through chemical vapour deposition for several years [1]. These films are made using a patented process where soybean oil is used as a precursor and processing is done under ambient air conditions, hence the name GraphAir [1]. CSIRO as a research entity seeks to develop technologies for commercial applications, for the case of this material several interesting areas have developed in surface coatings [2], transparent conductive electrodes [3] and sensors [1]. However, recently exciting developments have been made using this material as a membrane and to produce Terahertz devices. For membrane technologies (Figure 1a) we have scaled up the size of our membranes by 50x, increased the size of our membrane purification systems by 100x and reduced out costs by over 90%. We are exploring use cases across the energy, minerals, and beverage sectors. For Terahertz technologies [4] (Figure 1b) we have developed fabrication methods to produce tuneable devices operating from 0.2 to 1 THz and offer 16dB of tuning with just 6V applied to the films. We are targeting these frequencies as they present a gap in modern electronics, so far, we have produced tuneable absorbers [4] and polarisation converters. This presentation will dive into these developments with more depth.

## References

- [1] D. H. Seo *et al.* *Nat Commun*, 2017, vol. 8, pp. 1–9.
- [2] S. Choi *et al.*, 2019, *Journal of Materials Chemistry*, vol. 7, no. 9., pp. 4596–4603.
- [3] D. H. Seo *et al.*, *FlatChem*, 2018 vol. 8, pp. 1–8.
- [4] A. D. Squires *et al.*, *Commun Mater*, 2022, vol. 3, no. 1, p. 56.

## Figures



**Figure 1:** a) Graphene membrane performance, b) Terahertz device performance