

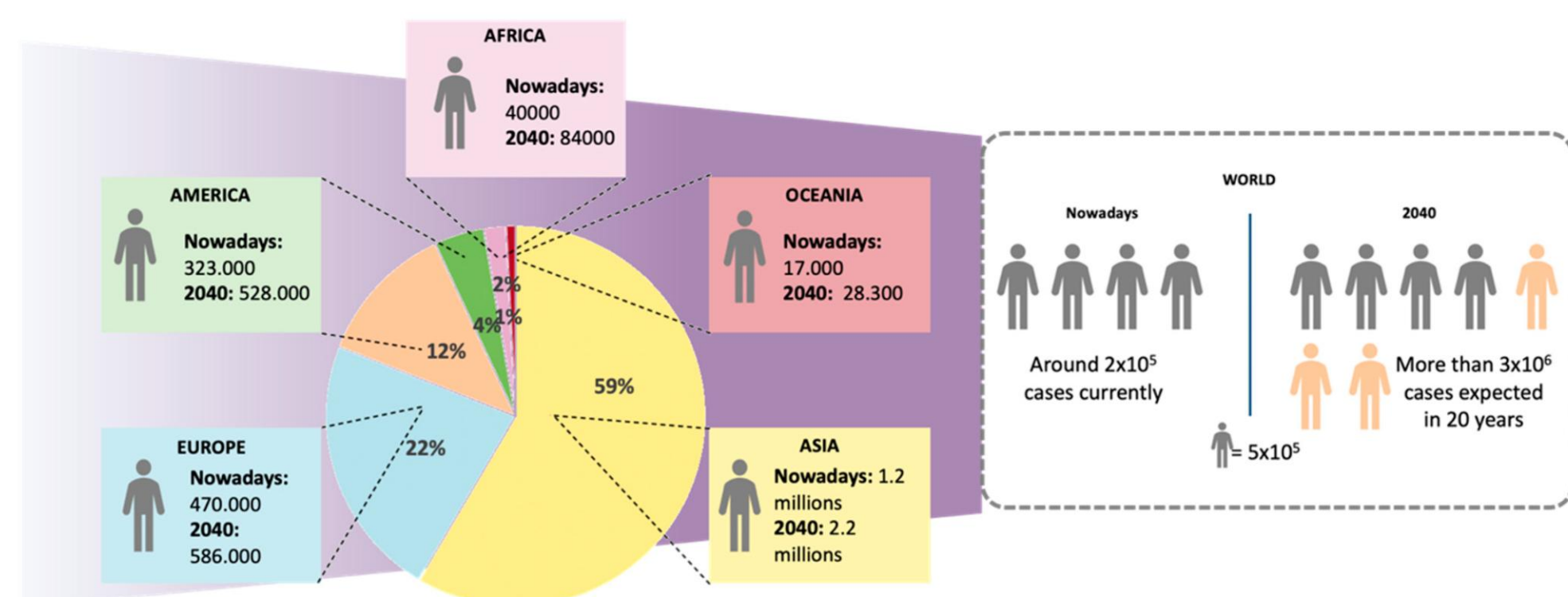
Early Detection of Lung Cancer Using Vacancy-Ordered Perovskite

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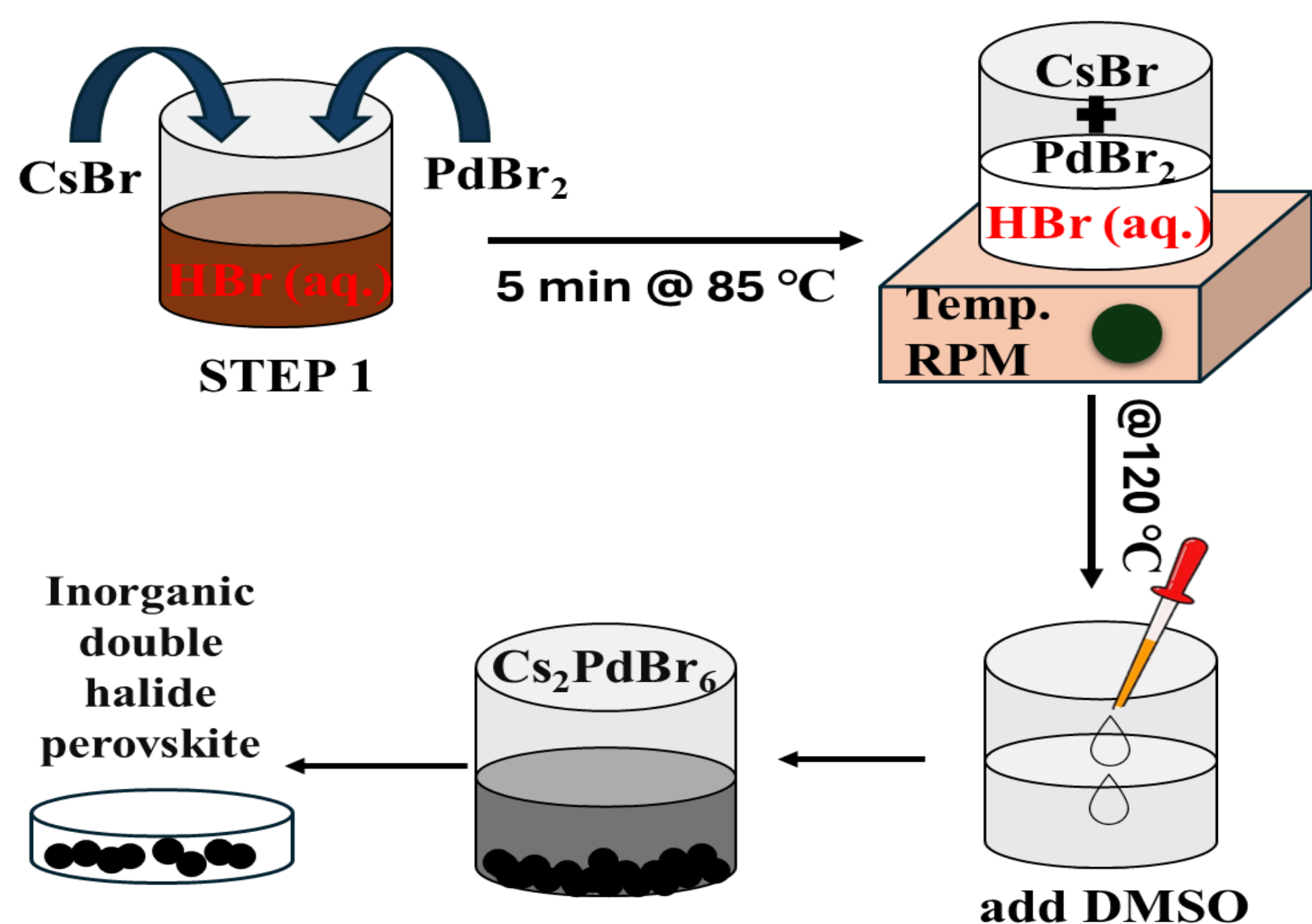
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INTRODUCTION & AIM



- Among all cancer types, the Lung cancer rate is high in men as compared to women.
- According to the study, Ethyl acetate (EA) is one of the lung cancer biomarkers.
- In this study, EA has been detected via the photoelectrochemical method.
- Double-halide perovskite is used as a sensor-active material for early cancer detection at 0 V bias in light and dark.

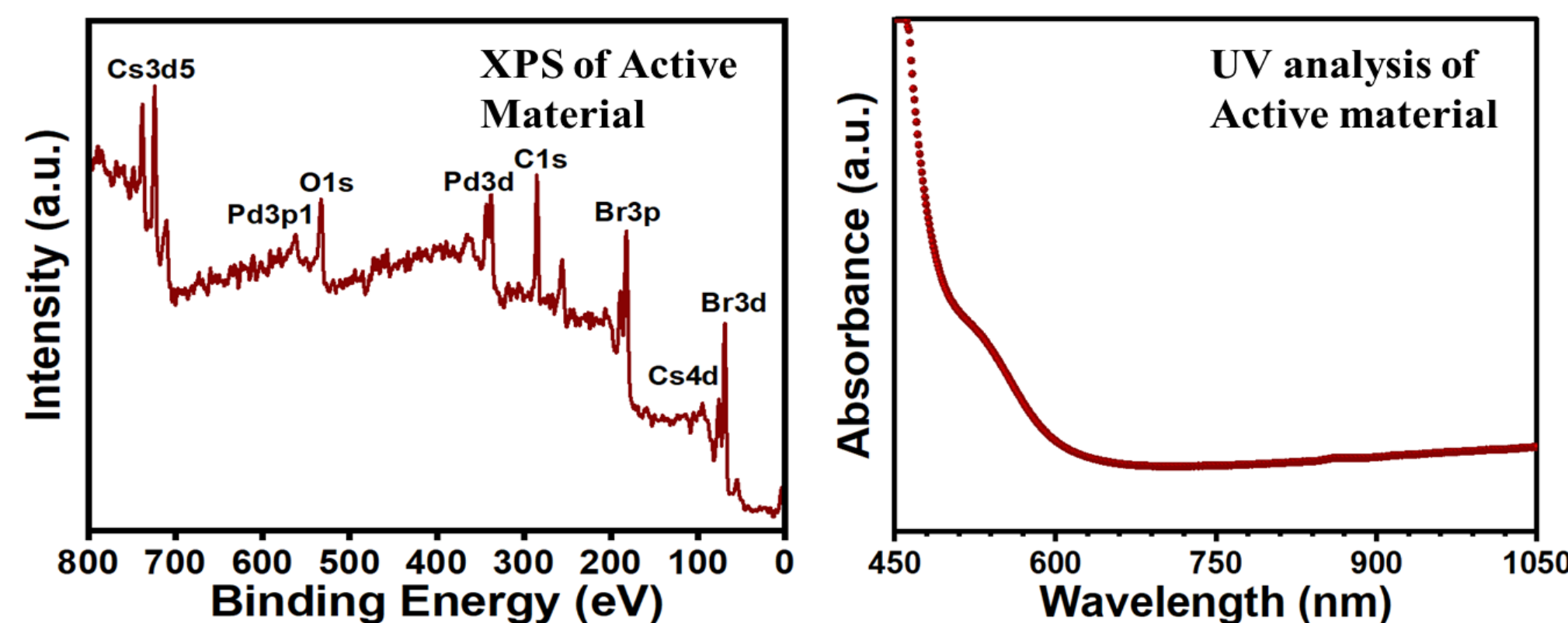
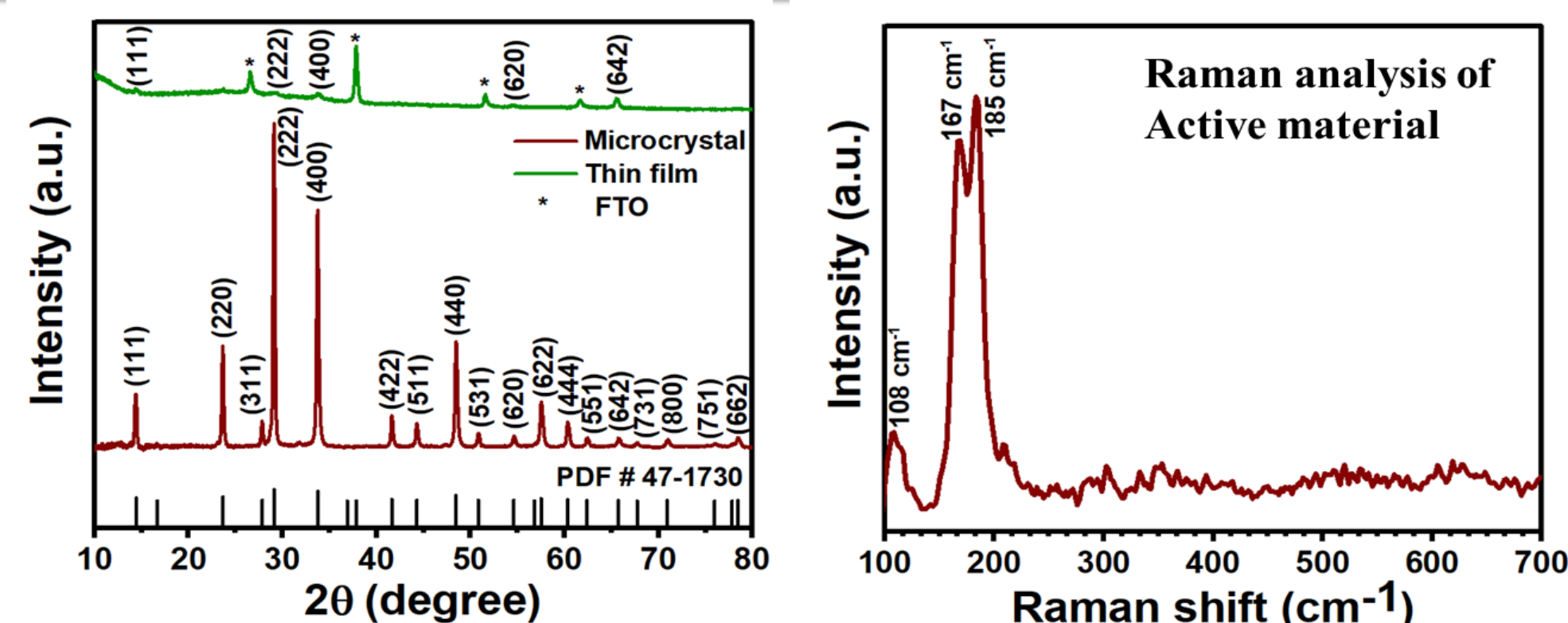
METHOD



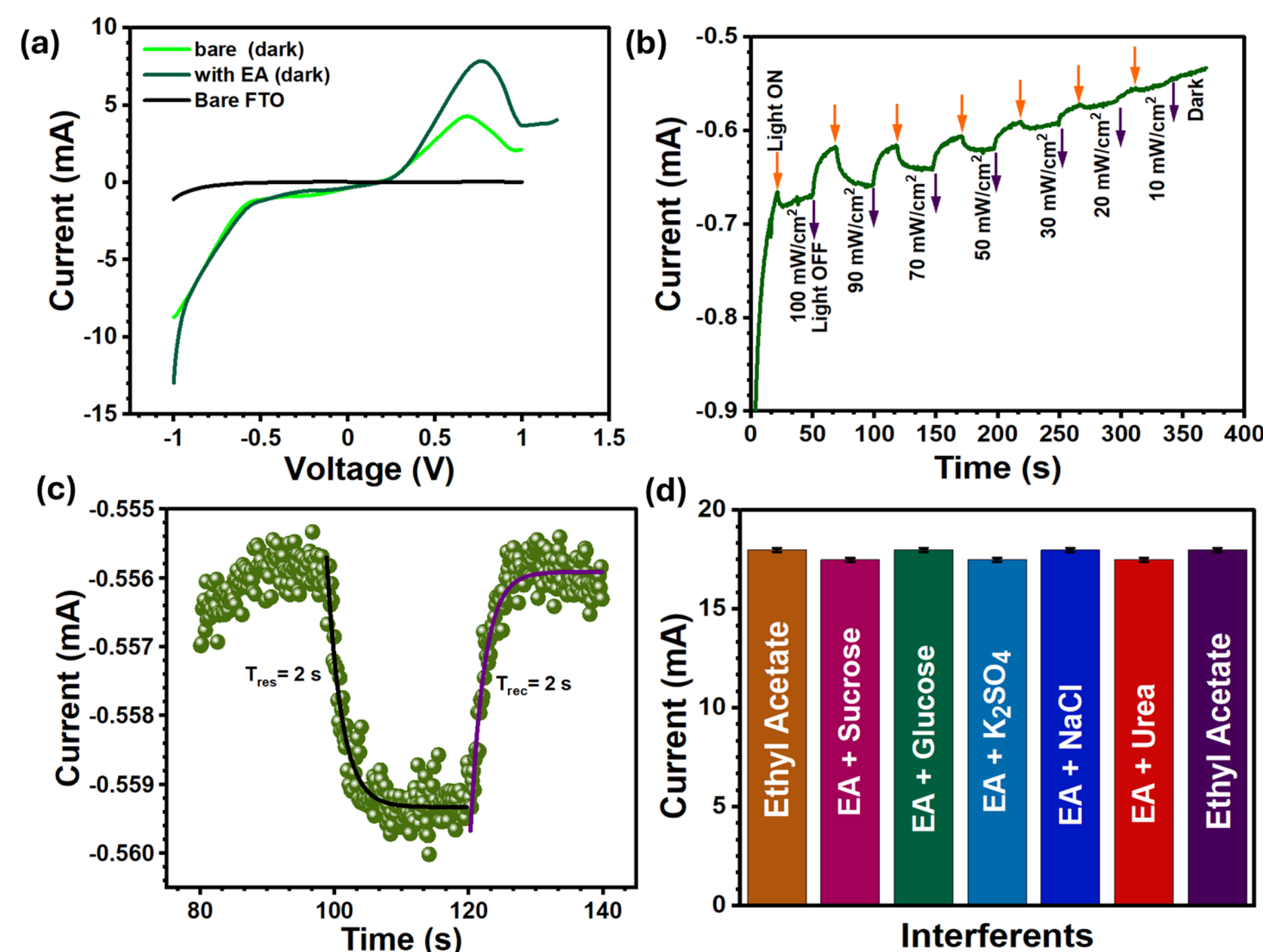
CONCLUSION

- The double halide perovskite has been successfully synthesized using the chemical precipitation method.
- The Cs₂PdBr₆ microcrystal with a bandgap of 1.6 eV and XRD, UV, and XPS has been analyzed for material characterization.
- As the light intensity decreases, the current response for 1 nM EA decreases.
- The active material shows higher sensitivity and higher selectivity towards ethyl acetate, with a response and recovery time for detection is 2s.
- The current response is one-fold higher in light as compared to dark at 0 V bias.

RESULTS & DISCUSSION



- The sensing active material has been successfully synthesized.
- XRD analysis shows the crystalline pattern of the powder. The thin film also showed the main peaks.
- The Raman spectroscopy shows the bonding between Cs-Pd and Pd-Br, symmetric and asymmetric stretching.
- XPS shows the synthesised material was pure with chemical bonding between it.



(a) I-V peaks in the presence of EA in dark (b) I-T at different light intensities (c) Response and recovery time (d) Interference test

- The peak current increases in the presence of EA even in the dark.
- The peak current varies with variation in light intensity. As the light intensity increases, the peak current increases in the presence of EA.
- The response and recovery time of each variation is 2s.
- Even in the presence of sucrose, glucose, K₂SO₄, NaCl, and Urea, we see the presence of ethyl acetate only.

REFERENCES

- [1] Subawickrama Mallika Widanaarachchige, N. R., Paul, A., Banga, I. K., Bhide, A., Muthukumar, S., & Prasad, S. (2025). Advancements in Breathomics: Special Focus on Electrochemical Sensing and AI for Chronic Disease Diagnosis and Monitoring. *ACS Omega*, 10(5), 4187–4196. <https://doi.org/10.1021/acsomega.4c10008>
- [2] da Costa, B. R. B., & De Martinis, B. S. (2020). Analysis of urinary VOCs using mass spectrometric methods to diagnose cancer: A review. *Clinical Mass Spectrometry*, 18, 27–37. <https://doi.org/10.1016/j.clinms.2020.10.004>
- [3] Wang, L., Lu, W., Zhu, W., Wu, H., Wang, F., & Xu, X. (2020). A photoelectrochemical sensor for highly sensitive detection of glucose based on Au–NiO_{1–x} hybrid nanowires. *Sensors and Actuators B: Chemical*, 304, 127330. <https://doi.org/10.1016/j.snb.2019.127330>