A Novel In-Doped Tin Oxide/Polyhydroxy-3-Butyrate Biopolymer Nanocomposite for Ethanol Gas Sensor

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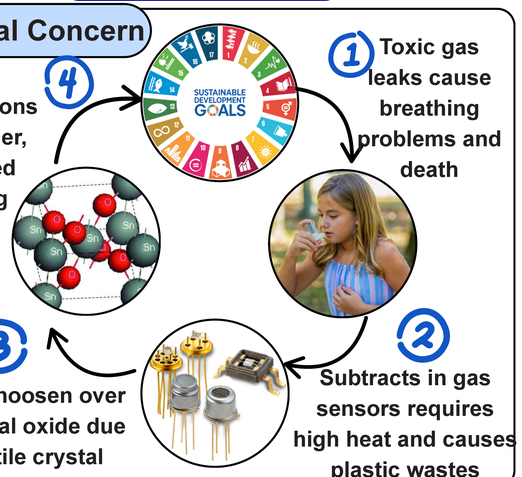
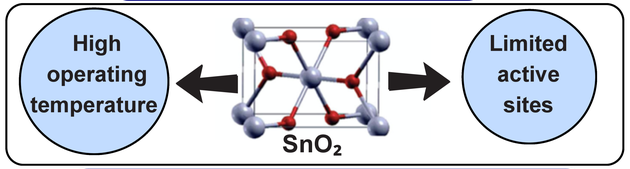
INTRODUCTION

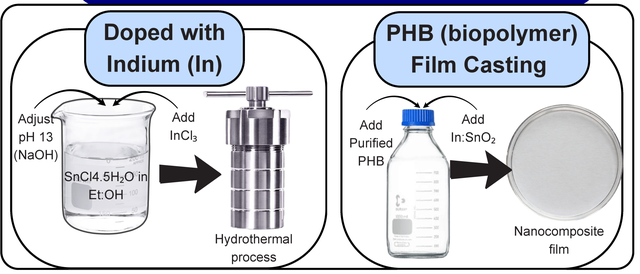
A Global Concern



PROBLEM STATEMENT

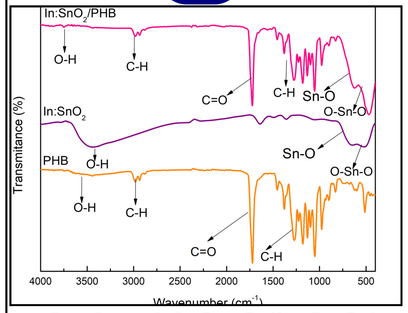


ADDRESSING THE CHALLENGE



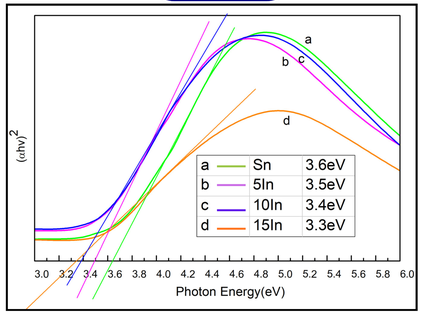
RESULTS AND DISCUSSION

FTIR



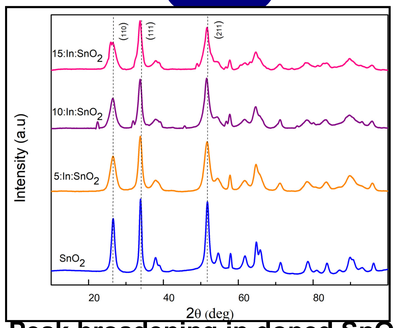
- Sn-O and O-Sn-O (In:SnO_2)
- C=O and C-H (PHB)

UV-DRS



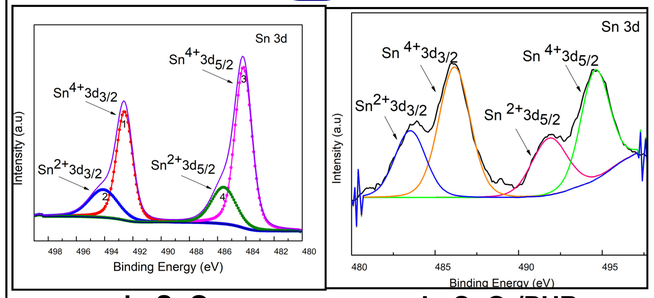
- Higher In mol% reduced the band gap

XRD



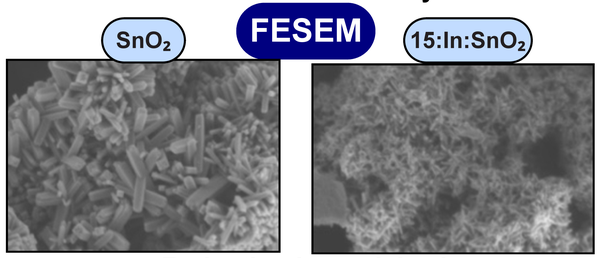
- Peak broadening in doped SnO_2 shows reduced crystallite size

XPS



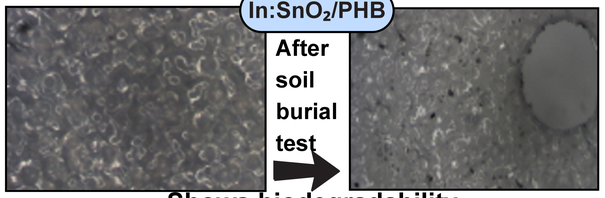
- Shifts in Sn 3d binding energy
- Reduction of Sn^{4+} to Sn^{2+} (oxygen vacancy)

FESEM



- Reduction in particle size

SOIL BURIAL TEST



- Shows biodegradability

BENEFITS & POTENTIAL

- In:SnO_2/PHB safe to use, requires a lower operating temperature, and is biodegradable
- In:SnO_2/PHB aligns with SDG 11 and SDG 12

CONCLUSION

- Doping with In enhances electronics and lowers operating temperature.
- PHB casting makes the sensing material a more flexible sensor.

ACKNOWLEDGEMENT

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REFERENCES

[1] Kong, Y., Li, Y., Cui, X., Su, L., Ma, D., Lai, T., Yao, L., Xiao, X., & Wang, Y. (2021). SnO_2 nanostructured materials used as gas sensors for the detection of hazardous and flammable gases: A review. Nano Materials Science, 4(4), 339–350.

[2] De Sousa, R. R., Junior, Cezario, F. E. M., Antonino, L. D., Santos, D. J. D., & Lackner, M. (2023). Characterisation of Poly(3-hydroxybutyrate) (P3HB) from Alternative, Scalable (Waste) Feedstocks. Bioengineering, 10(12), 1382.