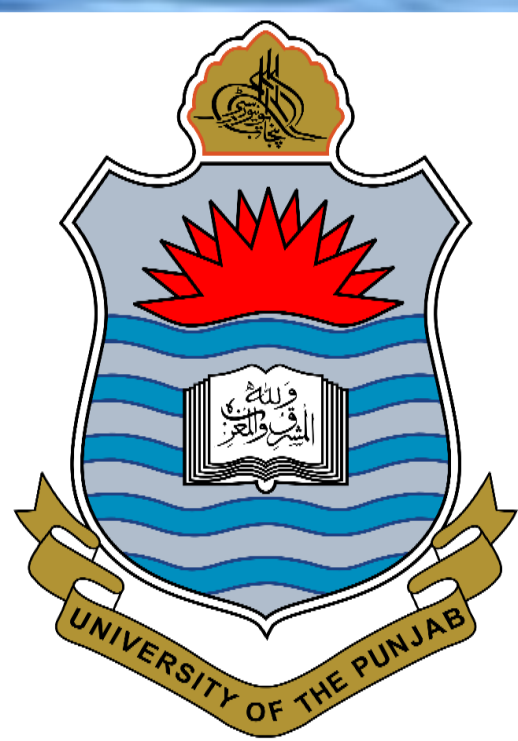




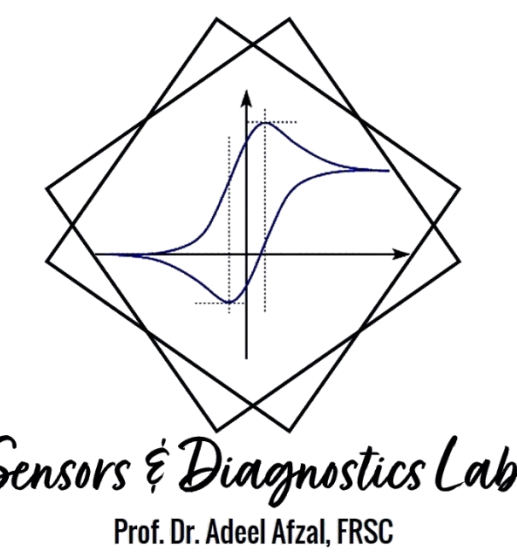
Structural, Dielectric and I-V Characteristics of $\text{Ba}_2\text{Mn}_{1-x}\text{Fe}_x\text{TeO}_6$ ($0.0 \leq x \leq 0.1$) Materials for Detection of Oral Squamous Cell Cancer (OSCC)

Umm-e-Farwa Mazhar^a, Uzma Hira^a, Adeel Afzal^a

^a School of Physical Sciences (SPS), University of the Punjab, New Campus, 54590 Lahore, Pakistan

^a School of Physical Sciences (SPS), University of the Punjab, New Campus, 54590 Lahore, Pakistan

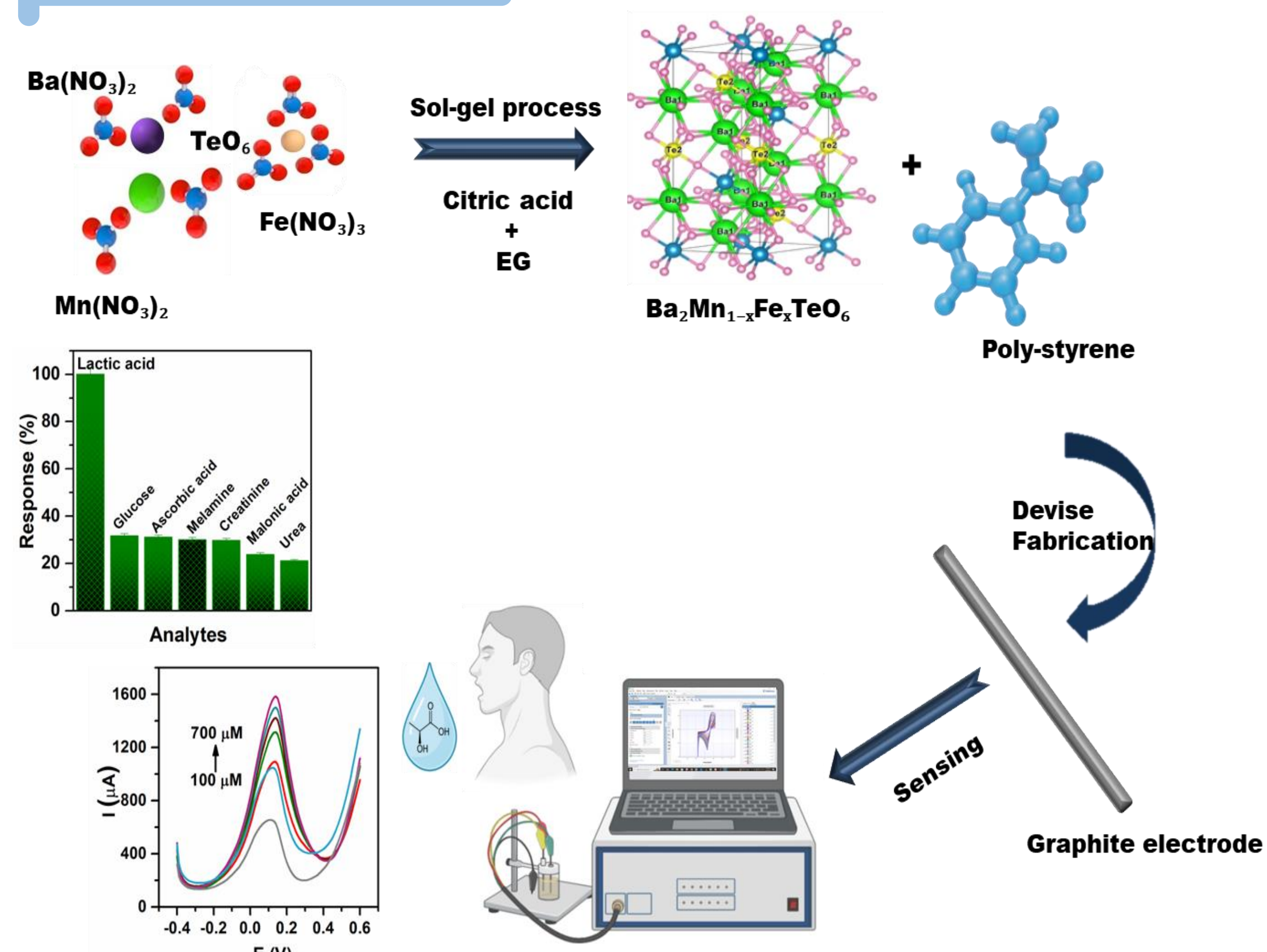
^a School of Chemistry (SC), University of the Punjab, New Campus, 54590 Lahore, Pakistan



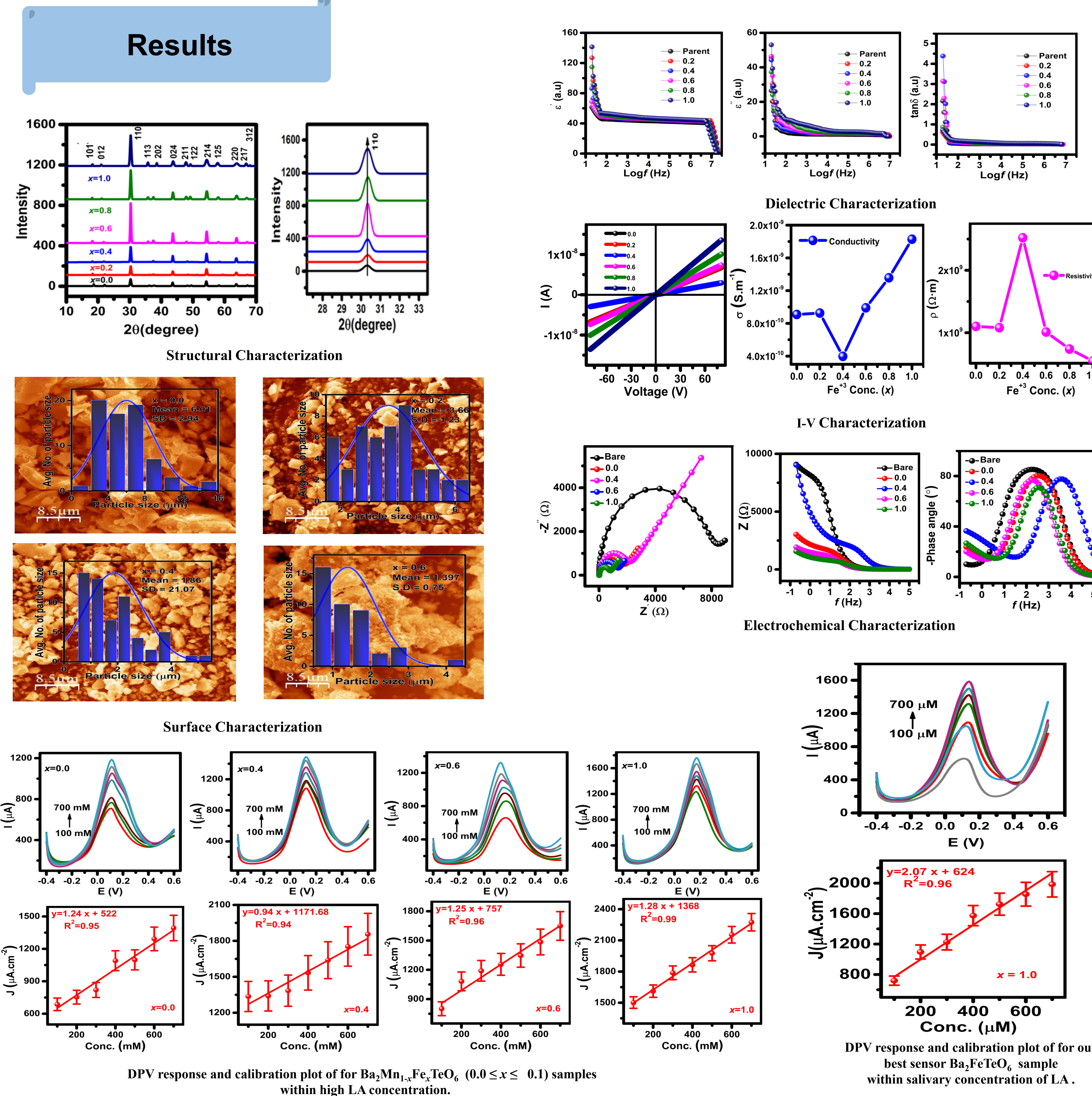
Objective

The early detection of oral squamous cell carcinoma (OSCC) is challenging due to the lack of reliable and non-invasive diagnostic tools. Conventional methods like chromatographic and spectrophotometric are costly, time-consuming, and limited in sensitivity. This research aims to develop a novel electrochemical sensing platform using Fe-doped double perovskites to enhance sensitivity and selectivity in trace-level LA detection. The fabricated perovskite-modified electrodes provide a low-cost, stable, and portable solution for non-invasive quantification of LA in saliva, offering significant potential for early diagnosis.

Methodology



Results



Sustainable Development Goals

- SDG 3 - Health: Early, low-cost, non-invasive cancer detection.
- SDG 9 - Innovation: Advanced perovskite-based diagnostic sensors.
- SDG 12 - Sustainability: Affordable and resource-efficient alternatives.
- SDG 17 - Collaboration: Interdisciplinary partnerships for global health.

Conclusion

Fe-doped $\text{Ba}_2\text{Mn}_{1-x}\text{Fe}_x\text{TeO}_6$ perovskites were engineered as electrochemical sensors for lactic acid detection, with Fe doping reducing R_{ct} ($1584 \rightarrow 688 \Omega$) and enhancing conductivity. The $\text{Ba}_2\text{FeTeO}_6$ sensor achieved excellent linearity ($R^2 = 0.99$), high sensitivity ($2.07 \mu\text{A}/\mu\text{M}$), ultralow LOD ($0.27 \mu\text{M}$), and ~ 99 – 100% recovery. These results demonstrate its strong potential as a low-cost, selective, and non-invasive diagnostic tool for early OSCC detection.