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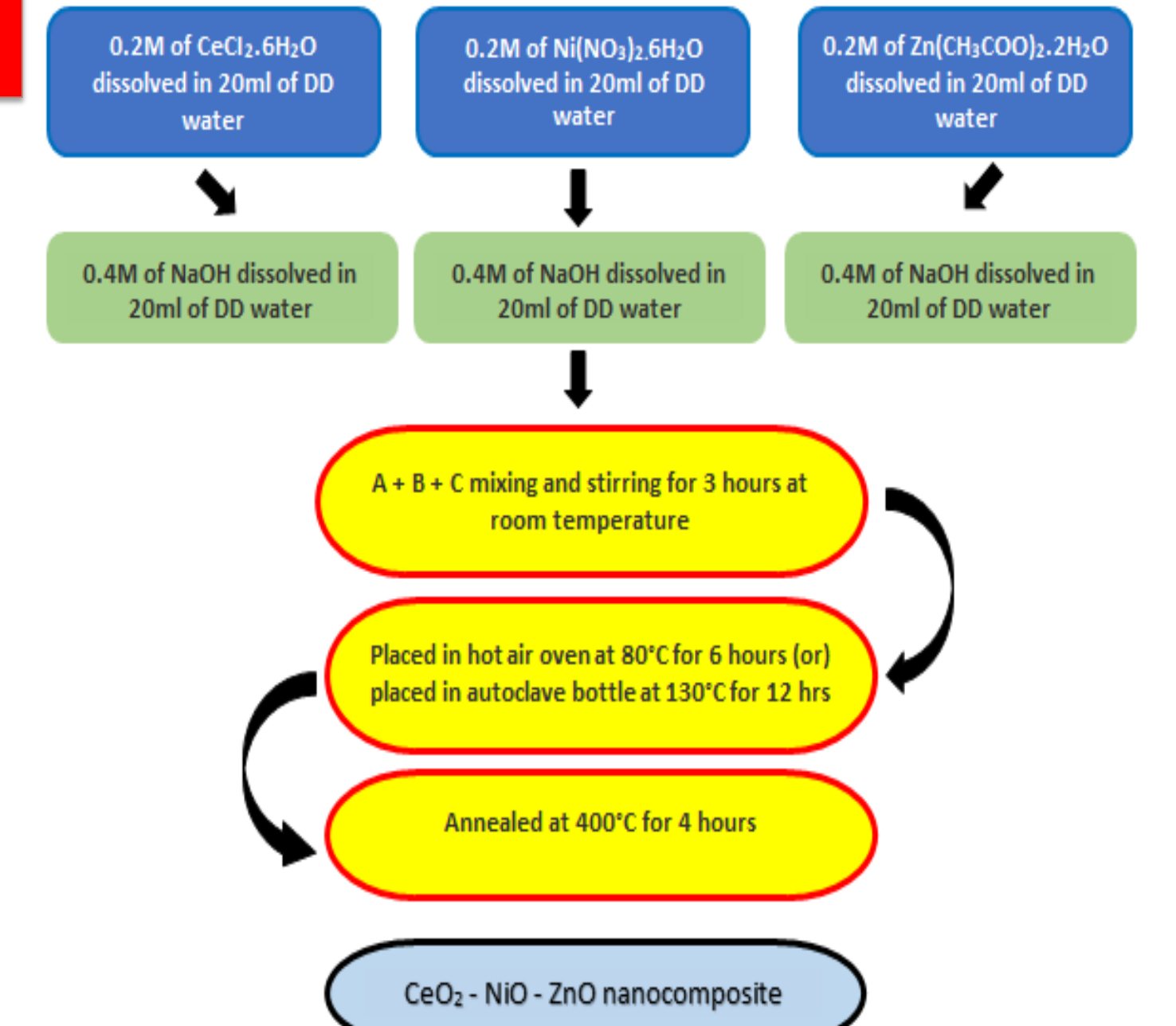
## ABSTRACT

Acetone level of diabetic patients from their breath can be detected. The effect of CeO<sub>2</sub>-NiO-ZnO nanocomposite was studied by adding different concentration of acetone. Structural (XRD, Raman) and morphological (SEM with EDAX) studies were done. The CV response of modified GCE with and without acetone was studied. It was observed that the current gets reduced in the presence of acetone. The sensor shows excellent sensitivity, selectivity and durability. The flexibility is an additional advantage of the sensor.

## Why CeO<sub>2</sub> - NiO - ZnO ?

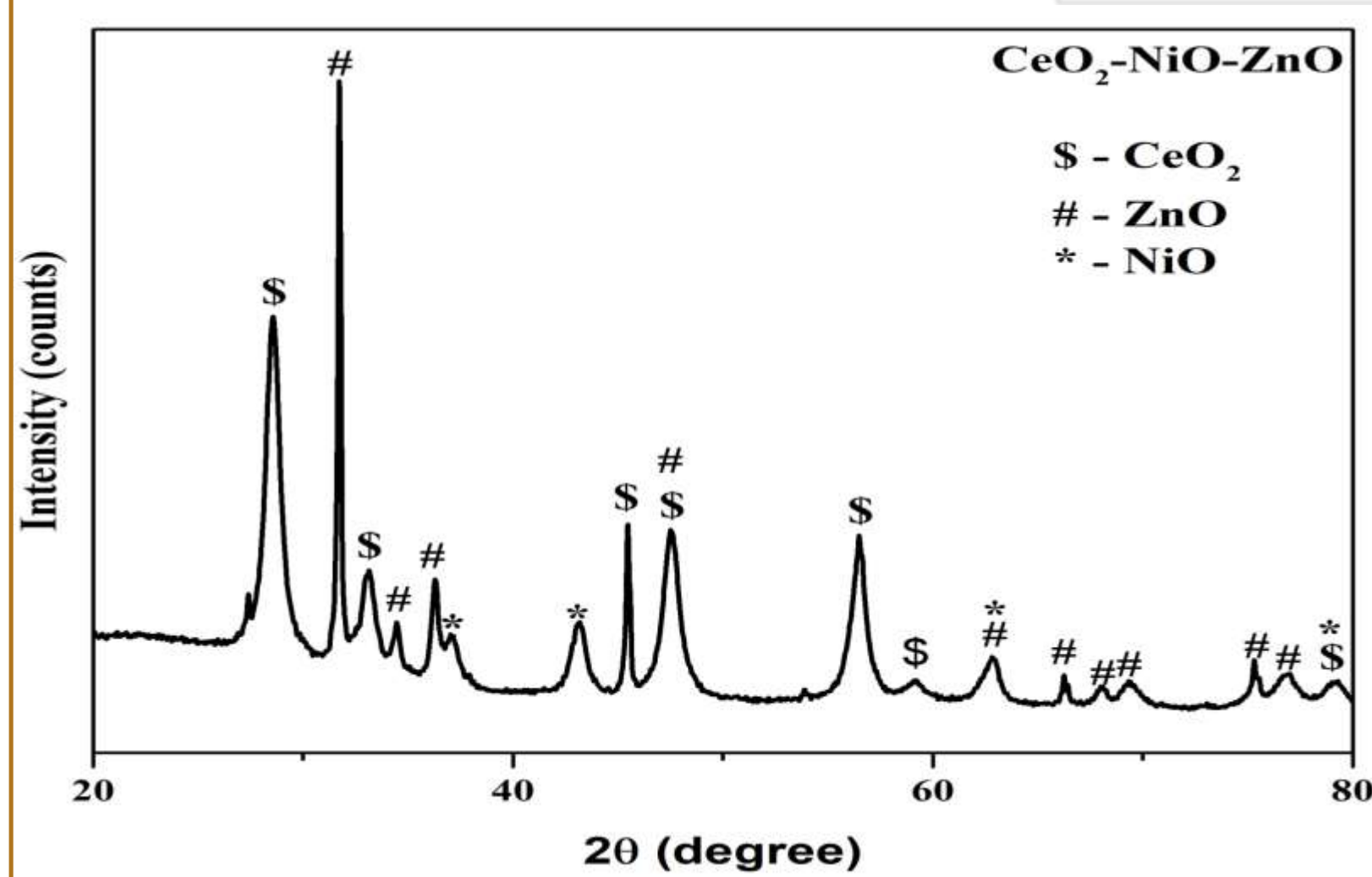
- Cerium oxide (CeO<sub>2</sub>) has properties of catalytic activity, electrochemical, high surface area, and oxygen transfer ability makes it one of the best candidate for biosensors.
- Nickel oxide (NiO) is stable and much better electro-catalytic thus enhancing the intensity of the electrochemical and suitable detection of analyte at very low concentration levels.
- Zinc oxide (ZnO) has been recognized as a good candidate for biosensor applications because of its high isoelectric point (IEP), cost effectiveness, nontoxicity, and chemical stability.

## Synthesis



## RESULTS & DISCUSSION

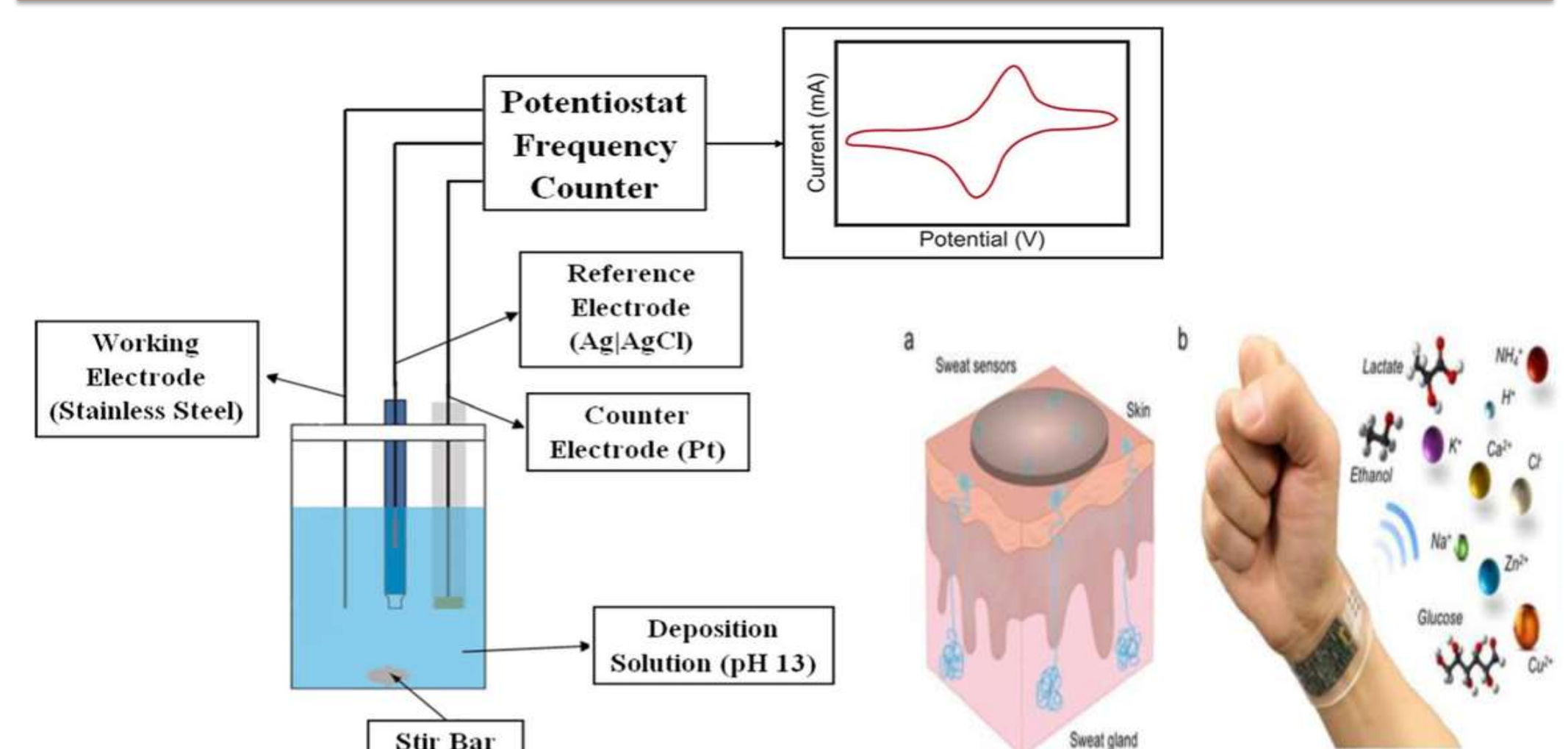
### Structural Studies



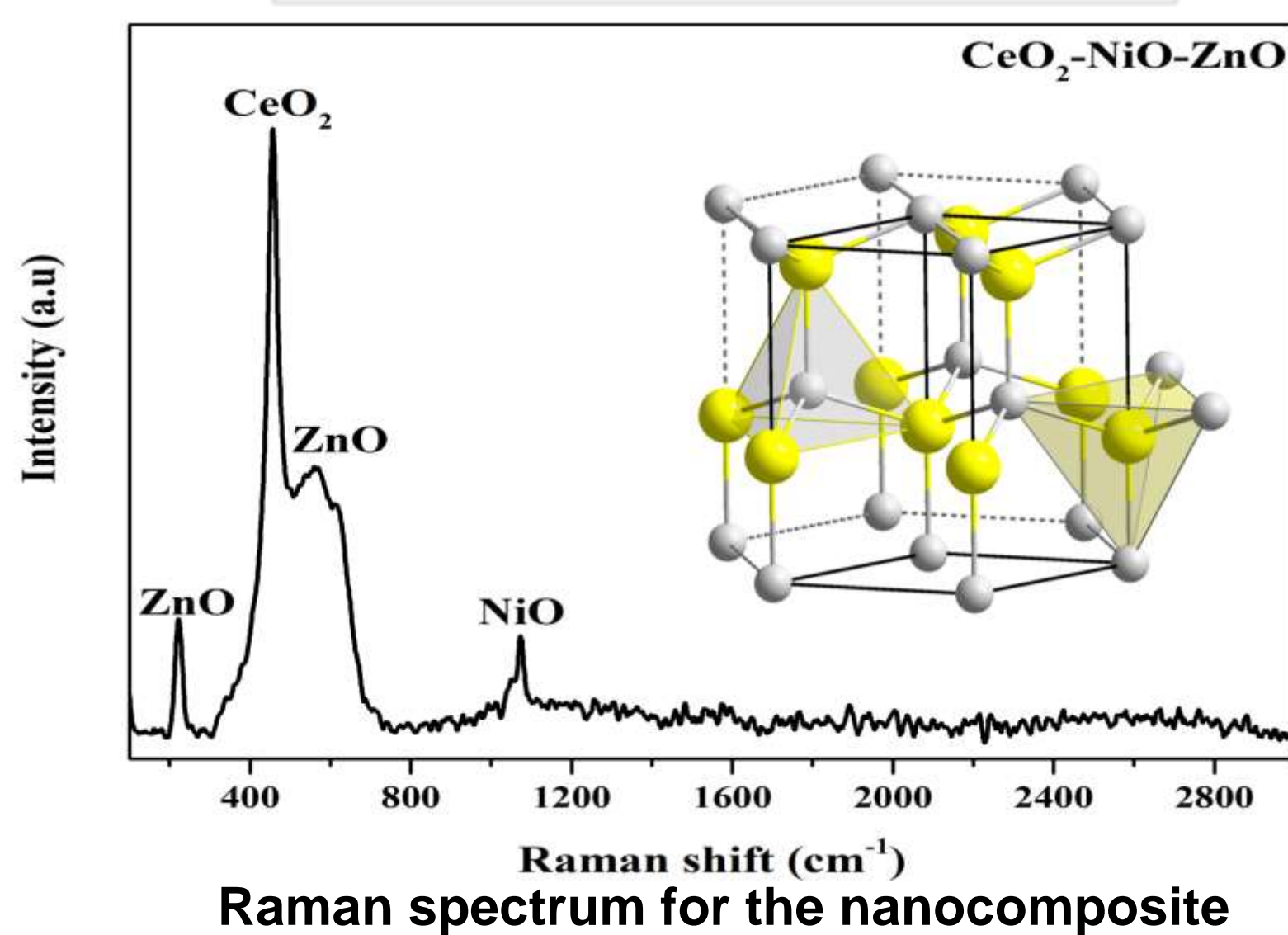
| Phase                    | Lattice parameter (nm) | Crystalline size (nm) | Dislocation density (lines/m <sup>2</sup> ) |
|--------------------------|------------------------|-----------------------|---|
| CeO <sub>2</sub> (Cubic) | a=b=c=0.5418           | 9.09                  | 12.10 × 10 <sup>15</sup>                    |
| NiO (Cubic)              | a=b=c=0.4221           | 17.19                 | 12.10 × 10 <sup>15</sup>                    |
| ZnO (Hexagonal)          | a=b=0.3241<br>c=0.5216 | 51.6                  | 12.10 × 10 <sup>15</sup>                    |

Physical Parameters

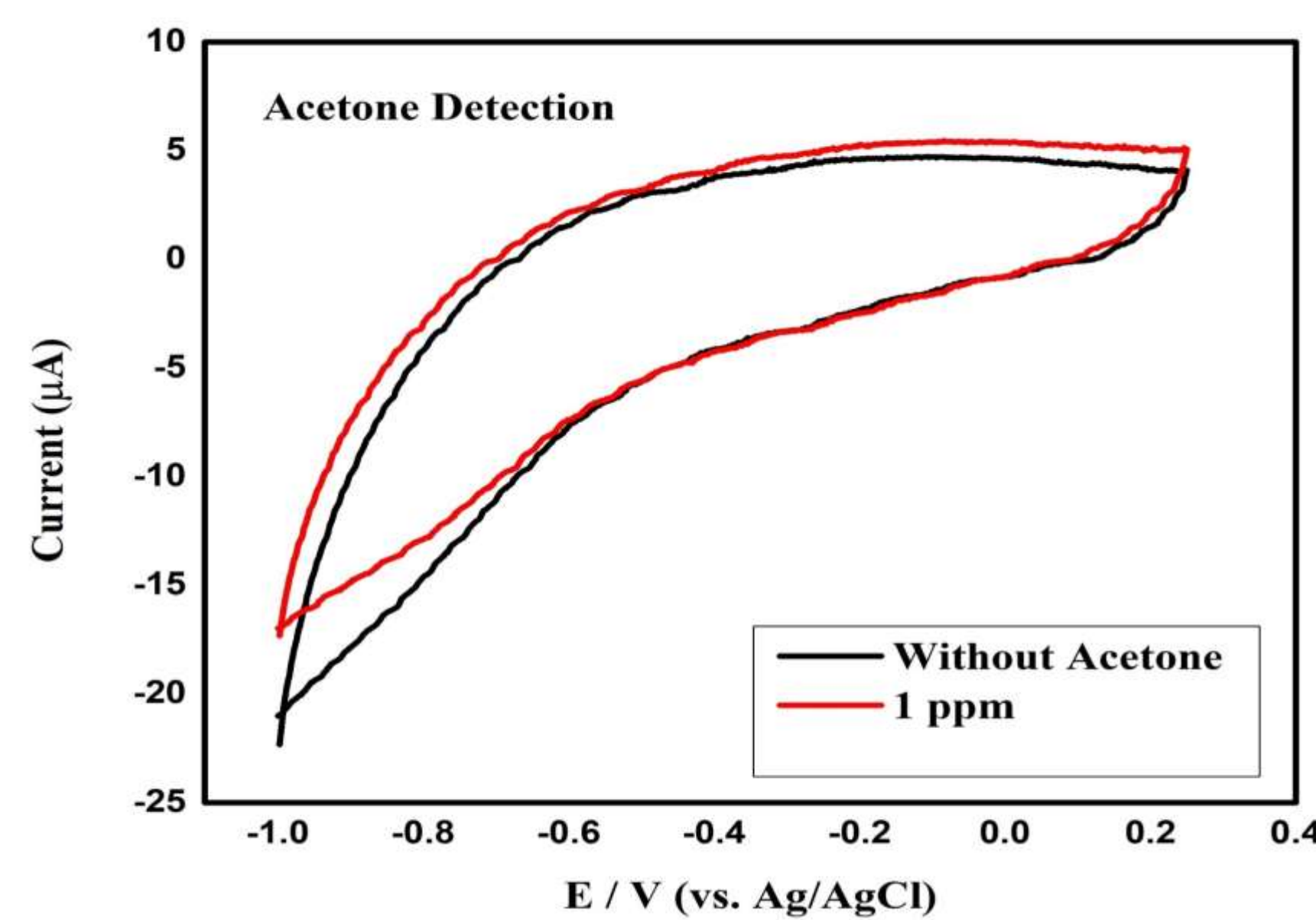
### SCHEMATIC DIAGRAM OF THE PROCESS



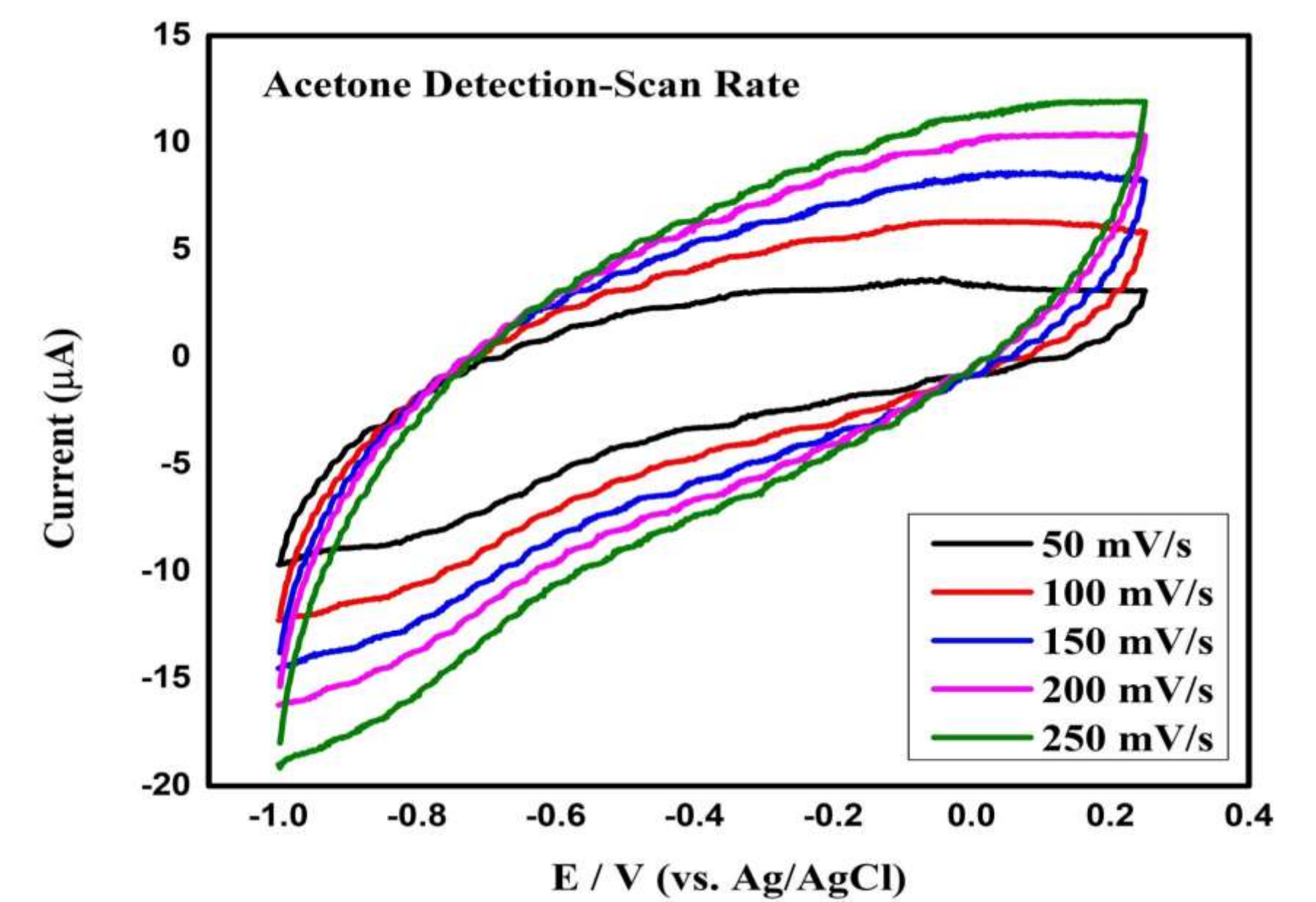
### Raman Studies



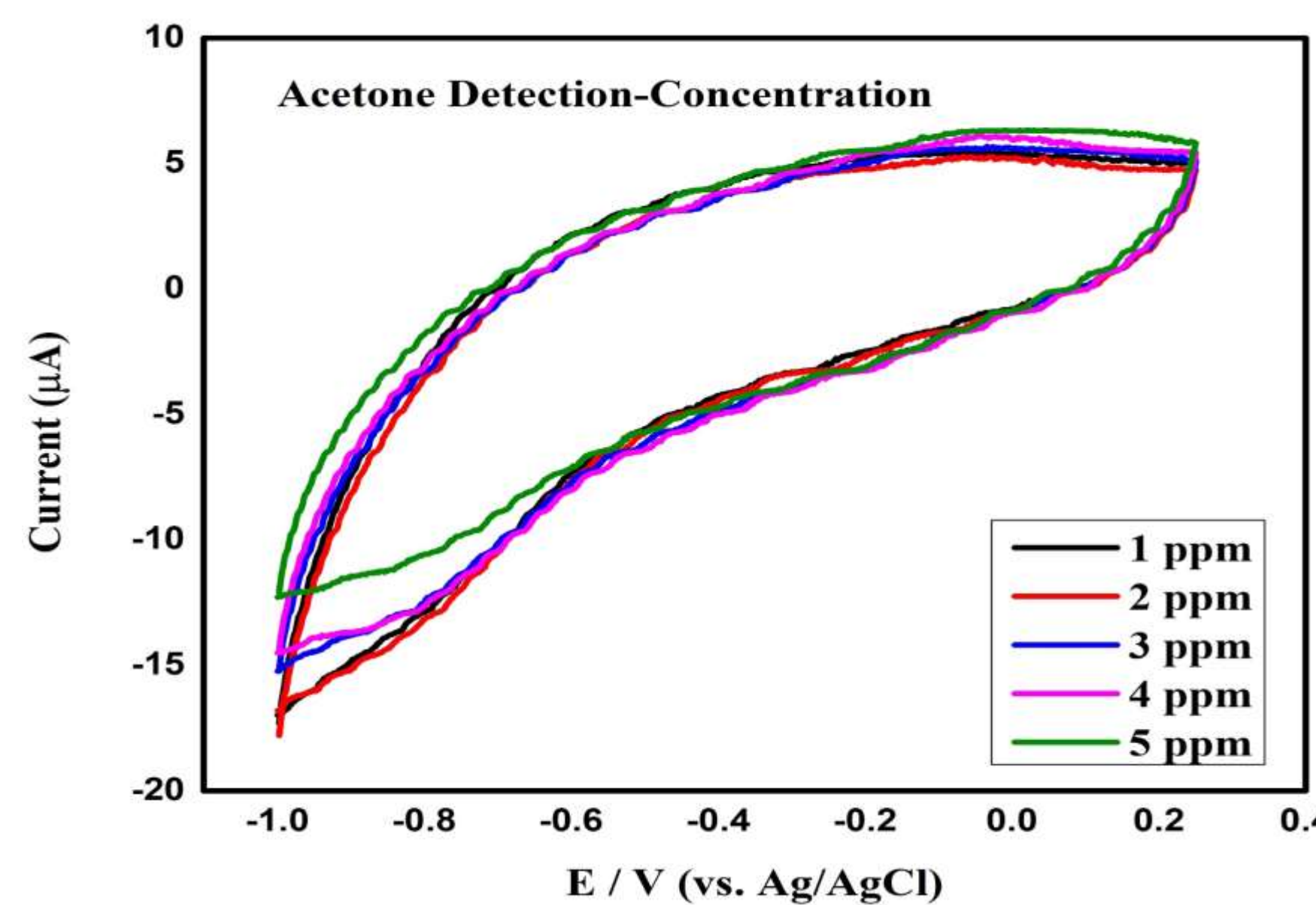
### Electrochemical Studies



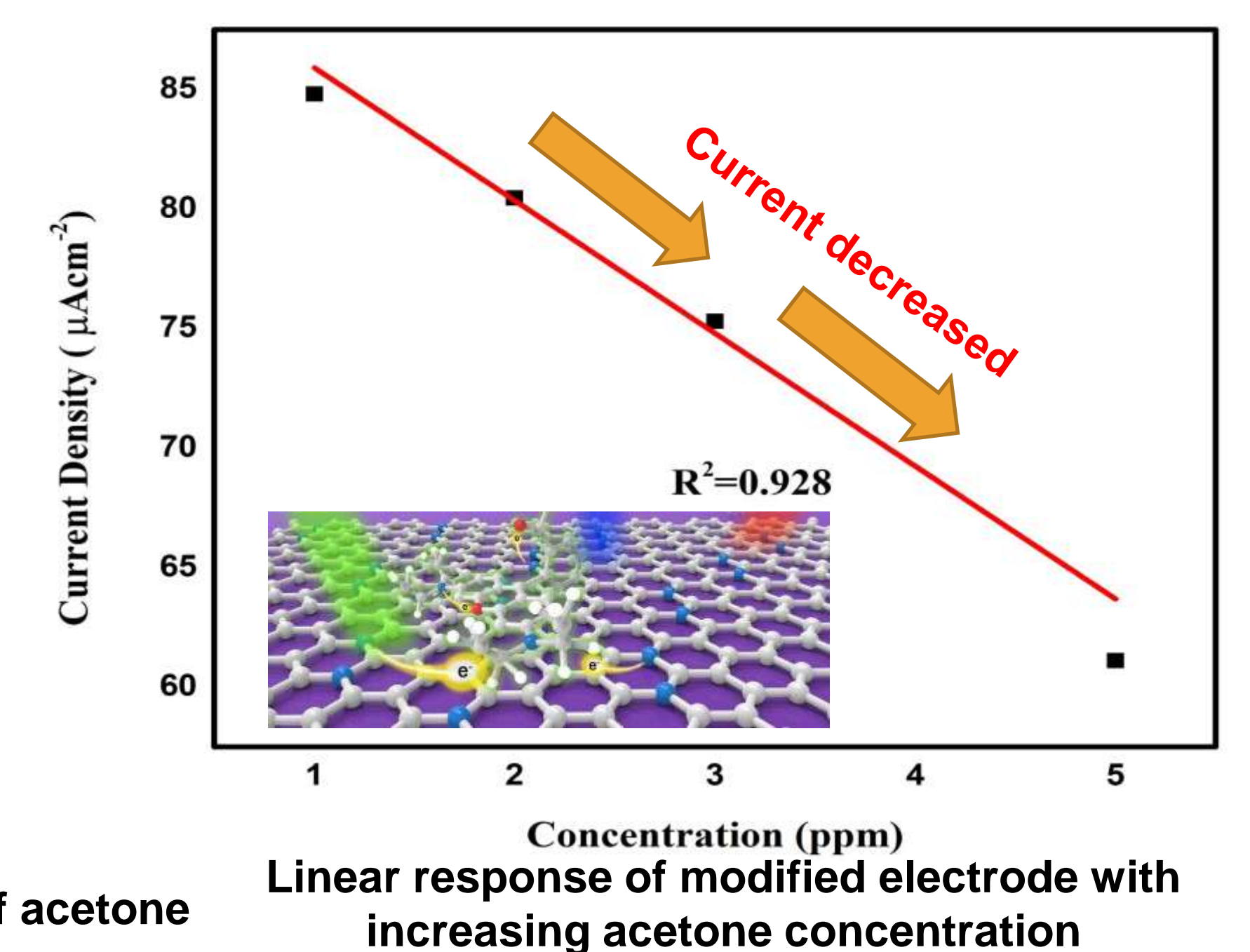
Modified electrode response with and without



Modified electrode response at different scan



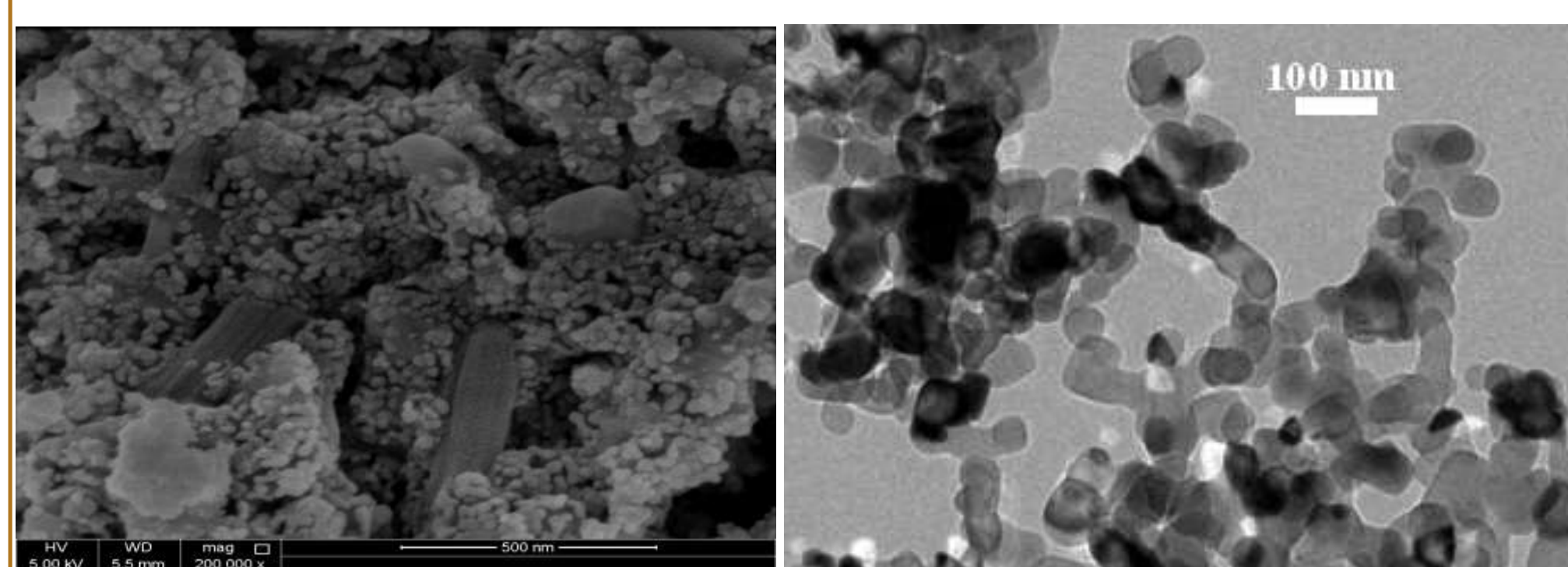
Modified electrode response at different concentration of acetone (100 mV/s)



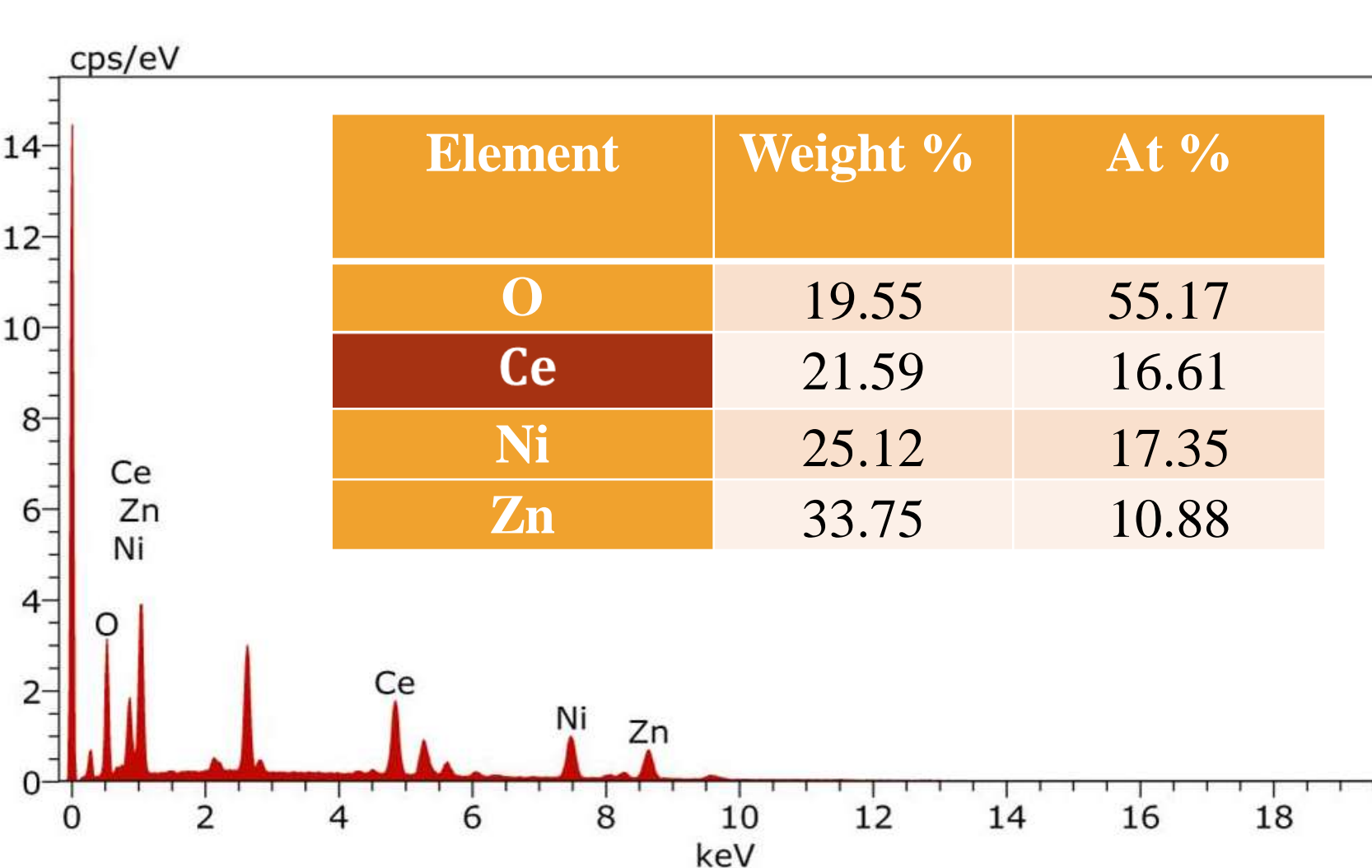
### BENEFITS TO QATAR

The biosensor can be used to detect the glucose level in the blood using the non-invasive method. This sensor will more efficient and comfortable to monitor the glucose on timely basis without taking the blood.

### Morphological Studies



SEM and TEM image for the nanocomposite



EDAX pattern for the nanocomposite

### CONCLUSION

- XRD: CeO<sub>2</sub> (Cubic), NiO (Cubic), ZnO (Hexagonal)
- Raman: 222 cm<sup>-1</sup> (ZnO), 455 cm<sup>-1</sup> (CeO<sub>2</sub>), 567 cm<sup>-1</sup> (ZnO), 1073 cm<sup>-1</sup> (NiO)
- SEM: CeO<sub>2</sub> - NiO - ZnO - nanoparticles
- The modified electrode shows linear response for acetone concentration
- of 1-5 ppm
- Electrochemical: Sensitivity (5.55 μA .cm<sup>-2</sup> .ppm<sup>-1</sup>) - Biosensing (Acetone detection)

### REFERENCES

- [1]Rahman M.M., Khan S.B., Asiri A.M., Alamry K.A., Khan A.A.P., Khan A., Rub M.A., Azum N. Acetone sensor based on solvothermally prepared ZnO doped with Co3O4 nanorods. Microchim. Acta. 2013;180:675-685.
- [2] Rahman M.M., Khan S.B., Jamal A., Faisal M., Asiri A.M. Fabrication of highly sensitive acetone sensor based on sonochemically prepared as-grown Ag<sub>2</sub>O nanostructures. Chem. Eng. J. 2012;192:122-128.

### ACKNOWLEDGEMENT

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