Chemo resistive Gas sensors

PRESENTED BY

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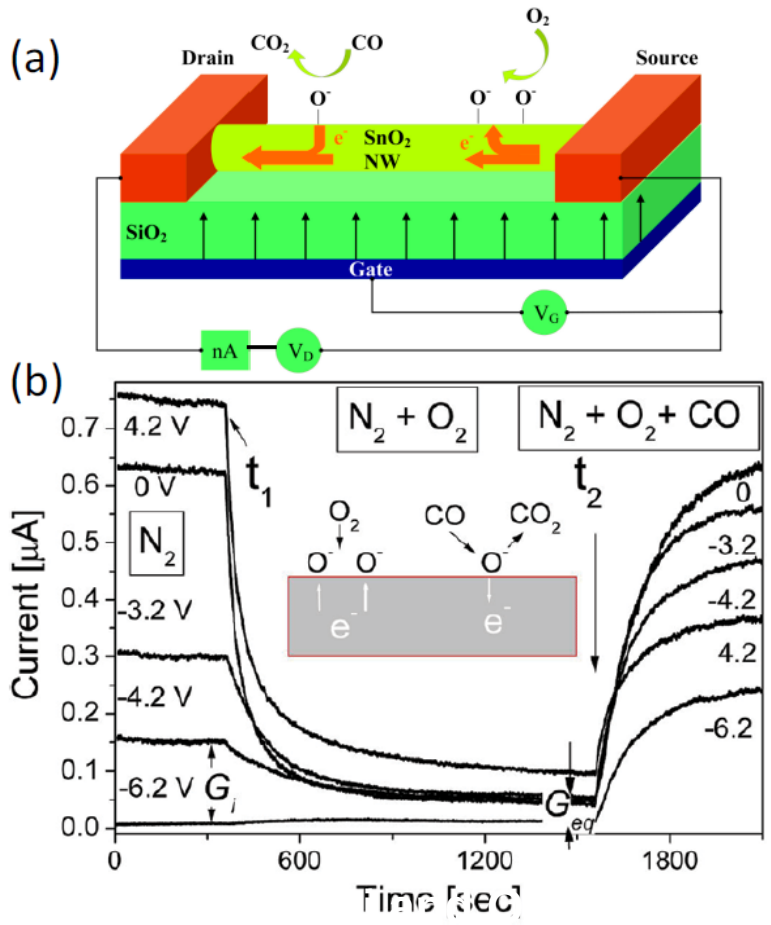
Objectives

- Metal Oxide Semiconductor (TiO_2 Anatase/Rutile Nanorod) Gas sensor which works at room temperature.
- Gas sensing chamber with Spring loaded contact pins.

Experimental mechanisms and data analysis

SnO_2 NW - FET gas sensor



...acting Nanowire Field-
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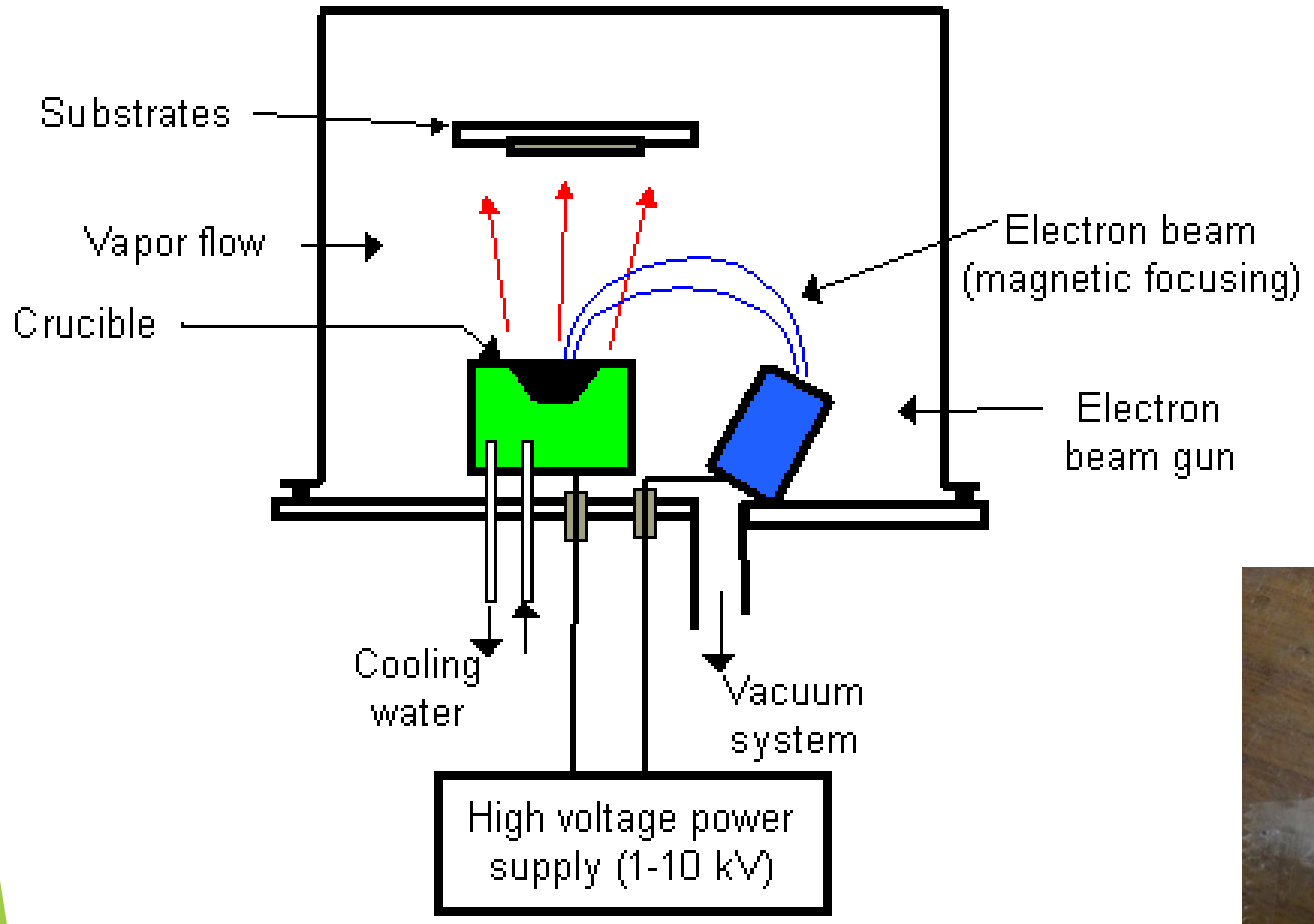
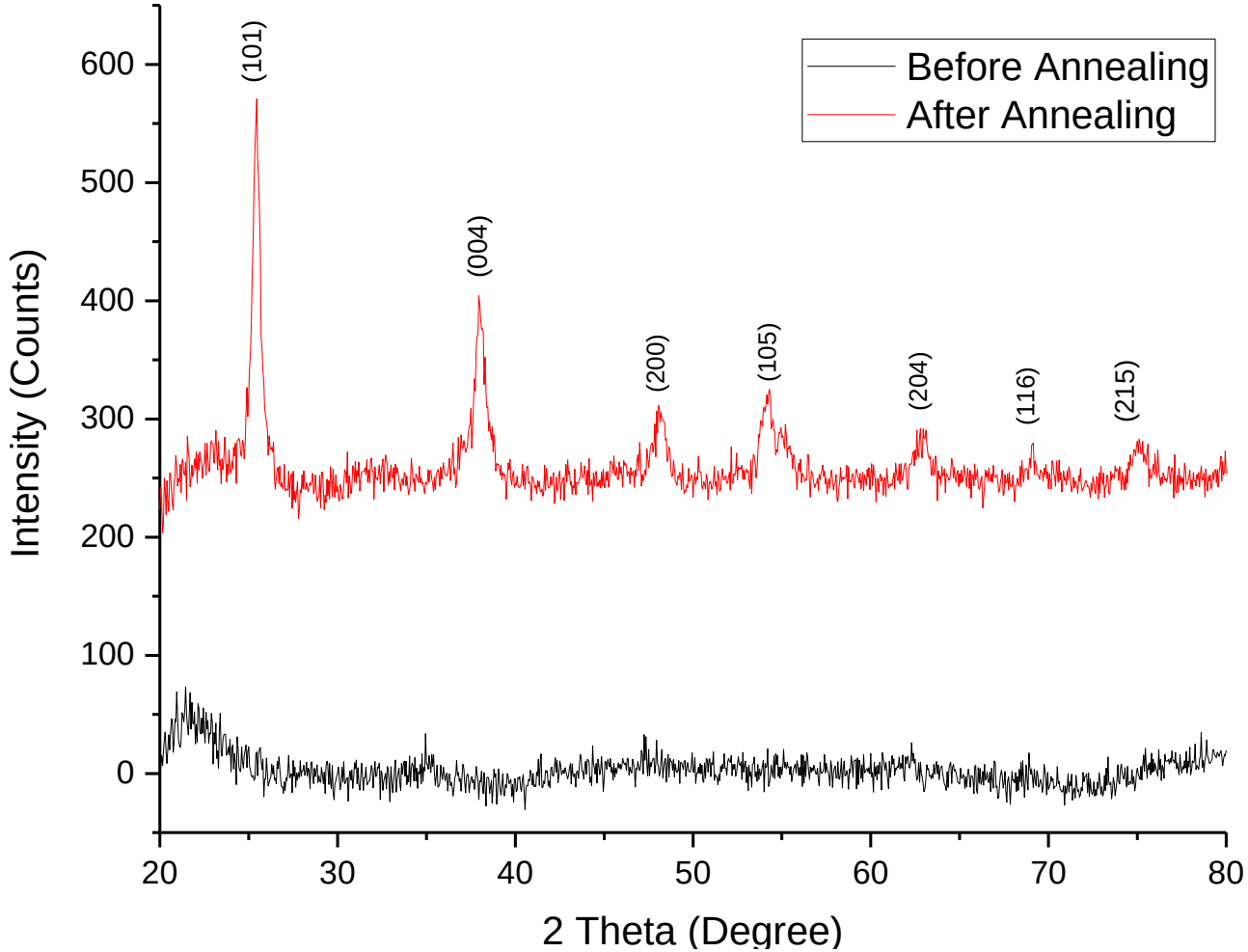
1.Electron Beam Evaporator



3 stages of Fabrication

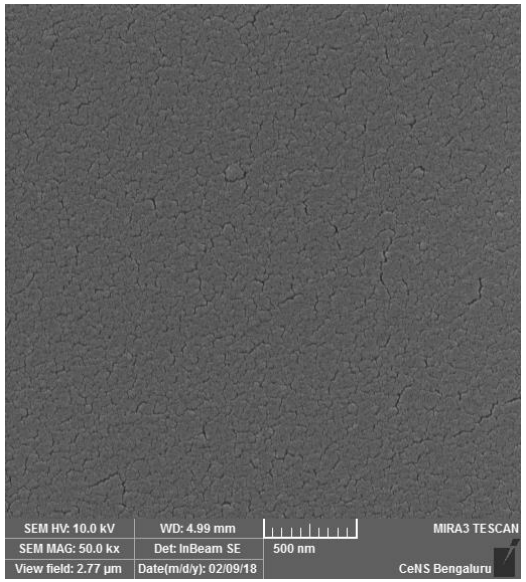
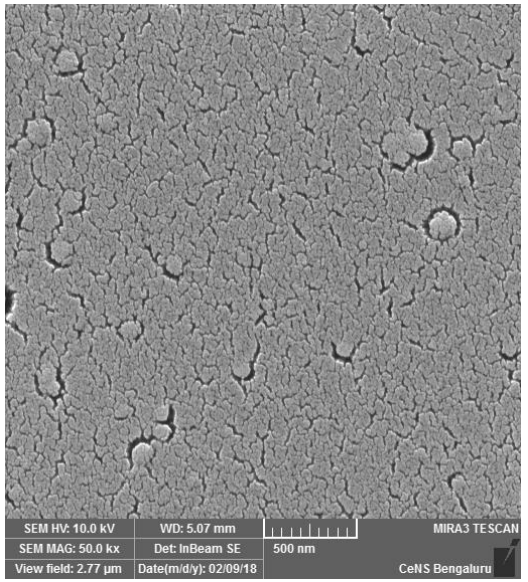
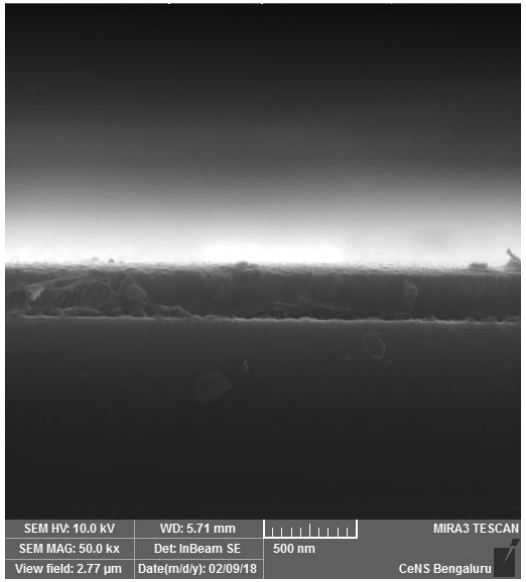
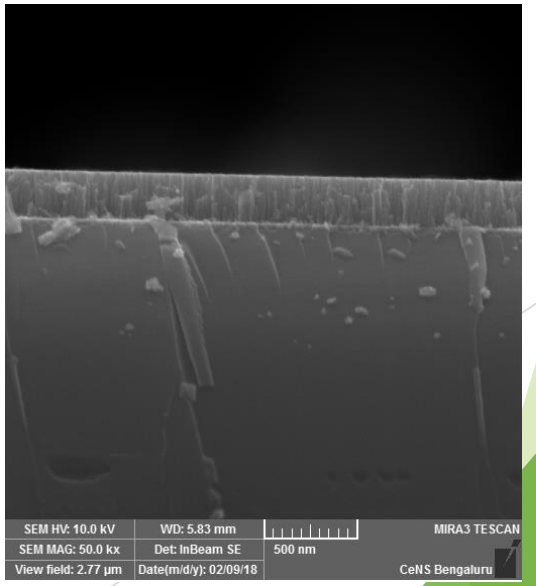
XRD data



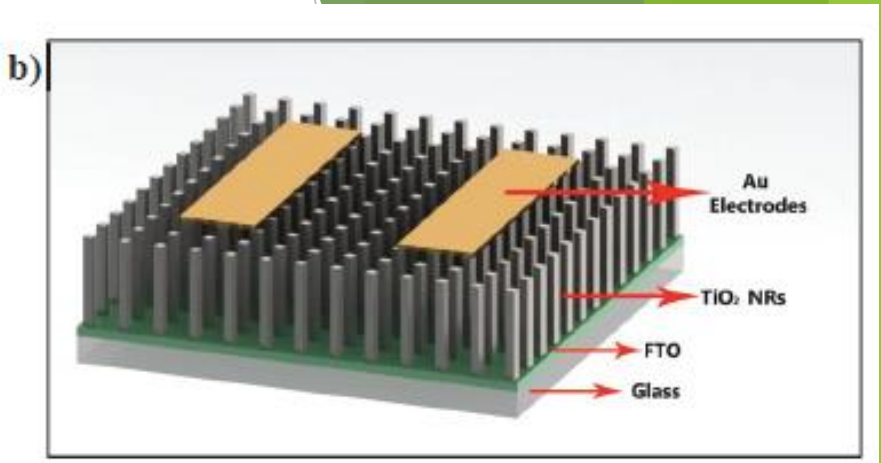
TiO2 - Anatase (Annealed at 500)

TiO2 - Amorphous

FESEM Image – Surface & Cross section

	Before Annealing	After Annealing
Surface		
Cross section		

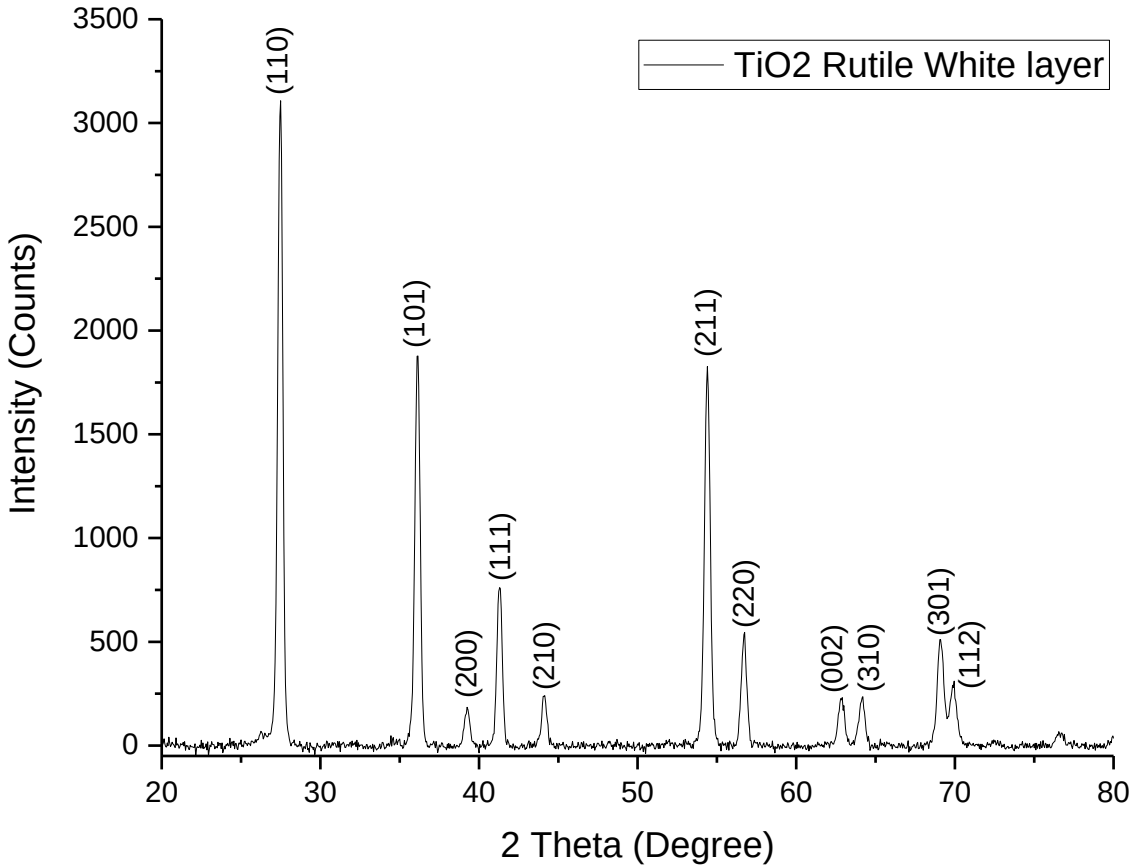
2. Solvothermal Synthesis

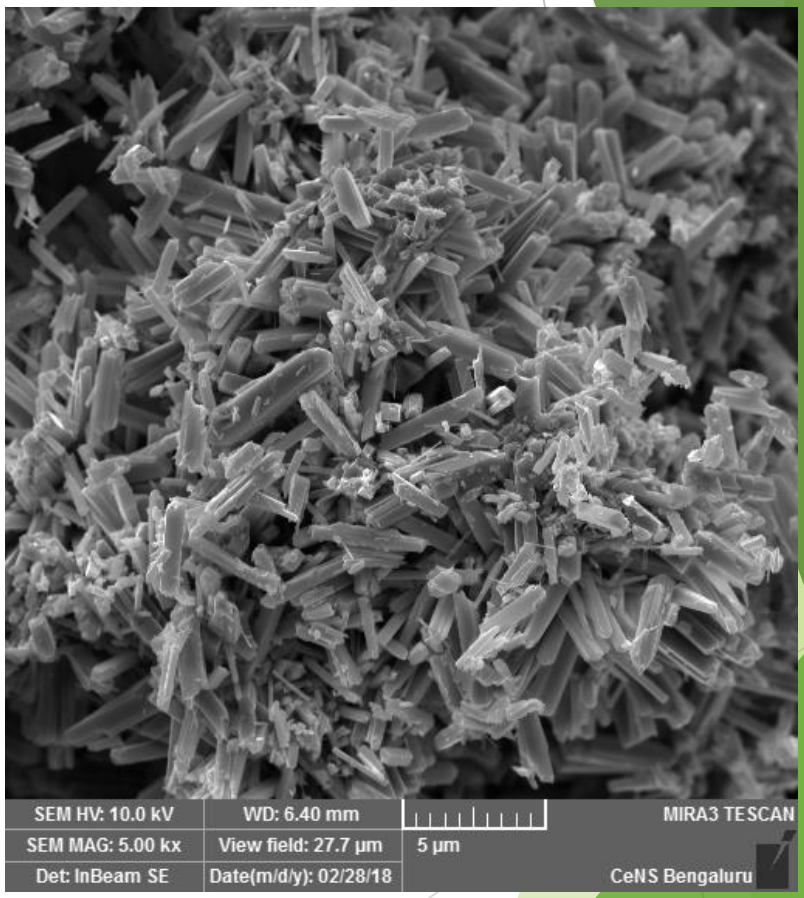


Reaction Steps

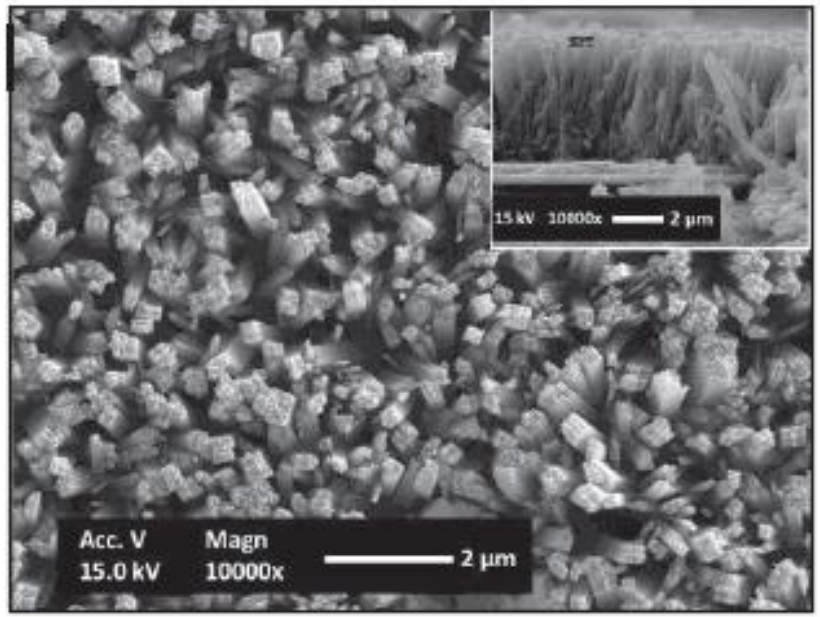
- FTO substrates were ultrasonically cleaned sequentially in acetone, ethanol and deionized water.
- At First, thin layer (seed layer) of TiO_2 was deposited on cleaned FTO substrates by immersing them in 0.03 M TTIP solution prepared in isopropyl alcohol followed by annealing at 400°C in air for 1 hour.
- The precursor solution for the solvothermal experiment was prepared by adding TTIP (1 ml) into a mixture of deionized water and concentrated HCl (each 30mL) took in a volume ratio of 1:1.
- The mixture was stirred well at room temperature and transferred into a Teflon lined autoclave. The solvothermal experiment was carried out at the optimized conditions 180°C for 3 hours.
- After synthesis, the substrate was taken out, rinsed extensively with deionized water and dried in ambient air.
- After fabrication of TiO_2 nanorods, Au electrodes were coated on the nanorods by thermal evaporation system in order to make electrical contacts.

XRD Data and SEM image – Top White Layer

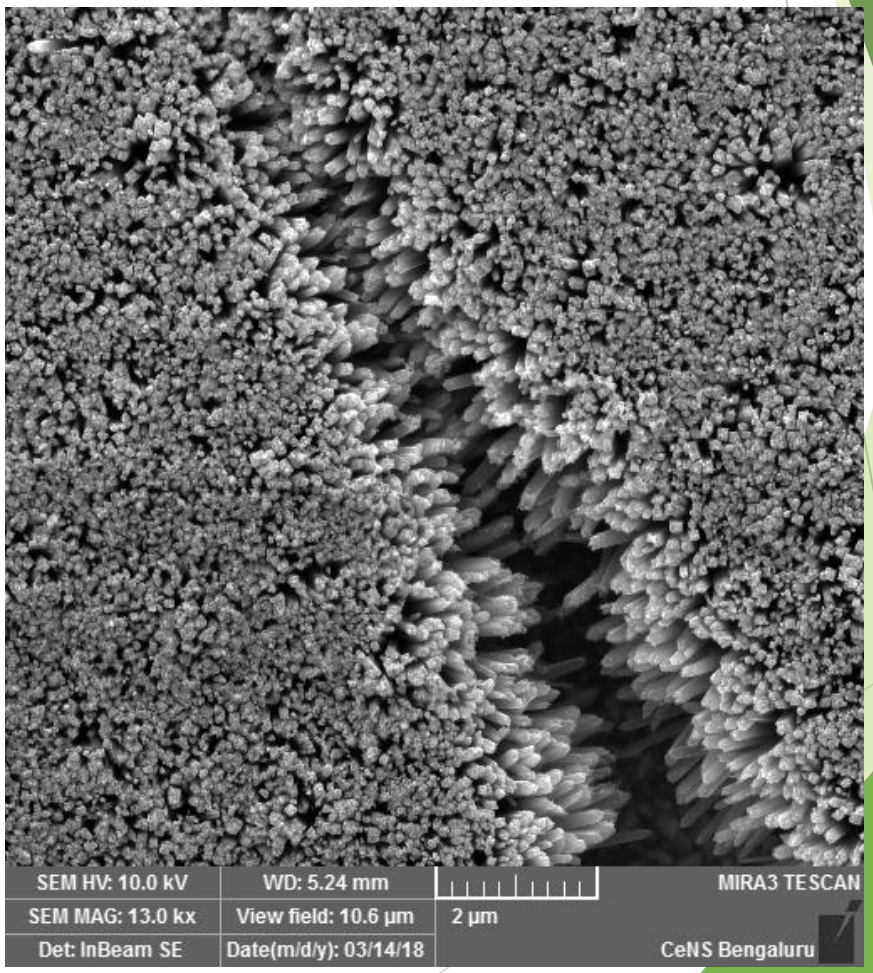




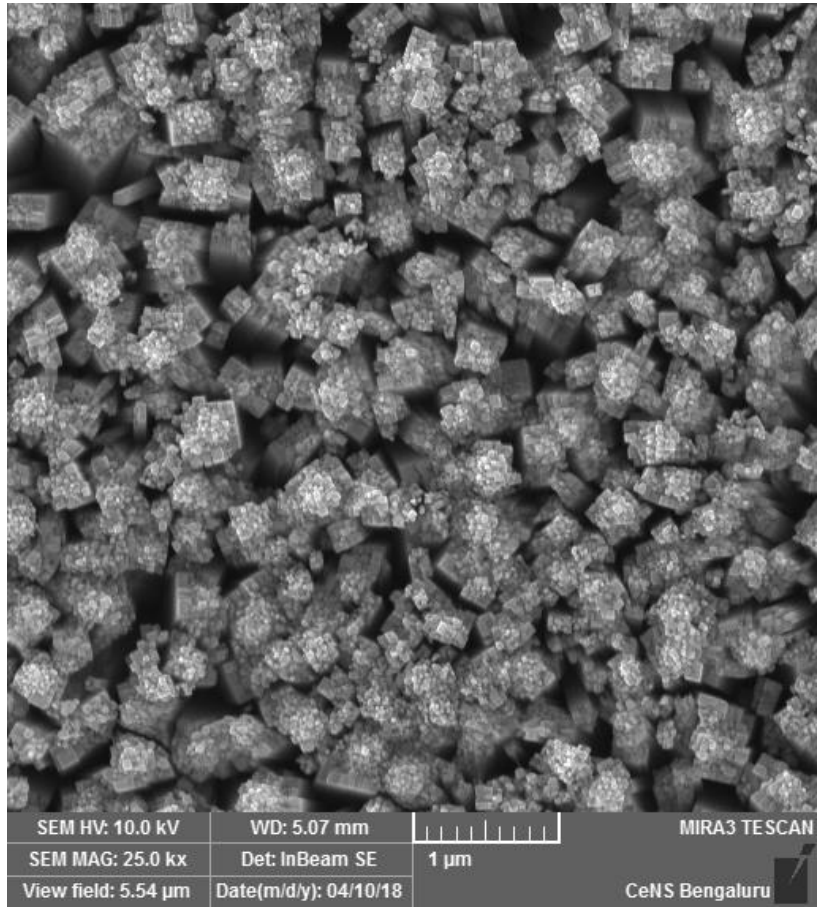
FESEM image – on FTO

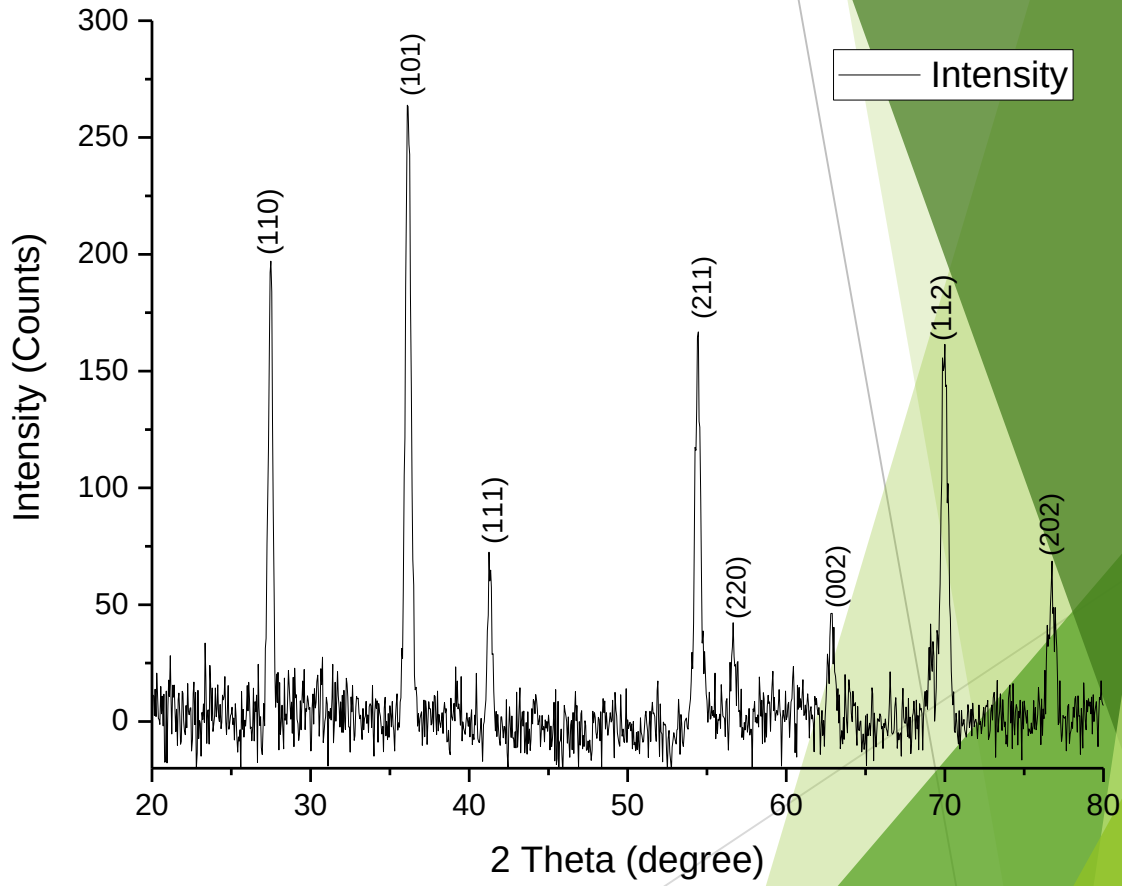


Onur Aleva, Erdem Şennikc, Necmettin Kılınç, Zafer Ziya Öztürka. Gas sensor application of hydrothermally growth TiO2 nanorods. *Procedia Engineering* 120 (**2015**) 1162 – 1165



Solvothermal 2nd Method





FUTURE PLANS

- Reduce gap between electrical contacts by projection lithography and increase the thickness of TiO_2 deposition thereby reducing the working resistance to the range of 10-50 MΩ. (Physical Method)
- Reduce nanorod surface resistance by doping or etching(Both Physical and Chemical Method).
- Fabrication of a gas sensing chamber with spring loaded contacts.