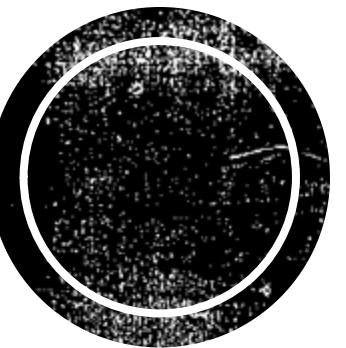




# Aerogels

Synthesis & Characterization



# **Team**

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# Aerogel Synthesis

→ (Step 1)

Misce. sol A :- will be prepared by adding Ammonium hydrogen difluoride (1.85g) ( $\text{NH}_4\text{F}$ ) in 100ml  $\text{H}_2\text{O}$  and 22.8 / 23 ml  $\text{NH}_3$  sol.

→ sol B:- will be prepared by mixing TEOS (5ml) (tetra ethyl ortho Silicate) in 11ml EtOH.

→ sol C:- will be prepared by adding 7ml of DI water to 11ml of EtOH followed by 0.04ml of sol A.

→ silica aerogel will be prepared by mixing sol B and sol C. (in 1:1 ratio)

# Aerogel Synthesis

## Measurements

sol       $\text{NH}_4\text{F}$ : - 1.85g + 100 mL  $\text{H}_2\text{O}$   
        4       $\text{NH}_4\text{OH}$ : - 23mL

OLB      TEOS: 5mL + Ethanol (11mL)

OLC       $\text{C}_2\text{H}_5\text{OH}$ - 0.5mL 7mL + Ethanol (11mL) +  
              SDA 10.4mL

÷ By 2 for proper ratio

~~0.925g  $\text{NH}_4\text{F}$  + 50 mL  $\text{H}_2\text{O}$  + 11.5 mL  $\text{NH}_4\text{OH}$~~

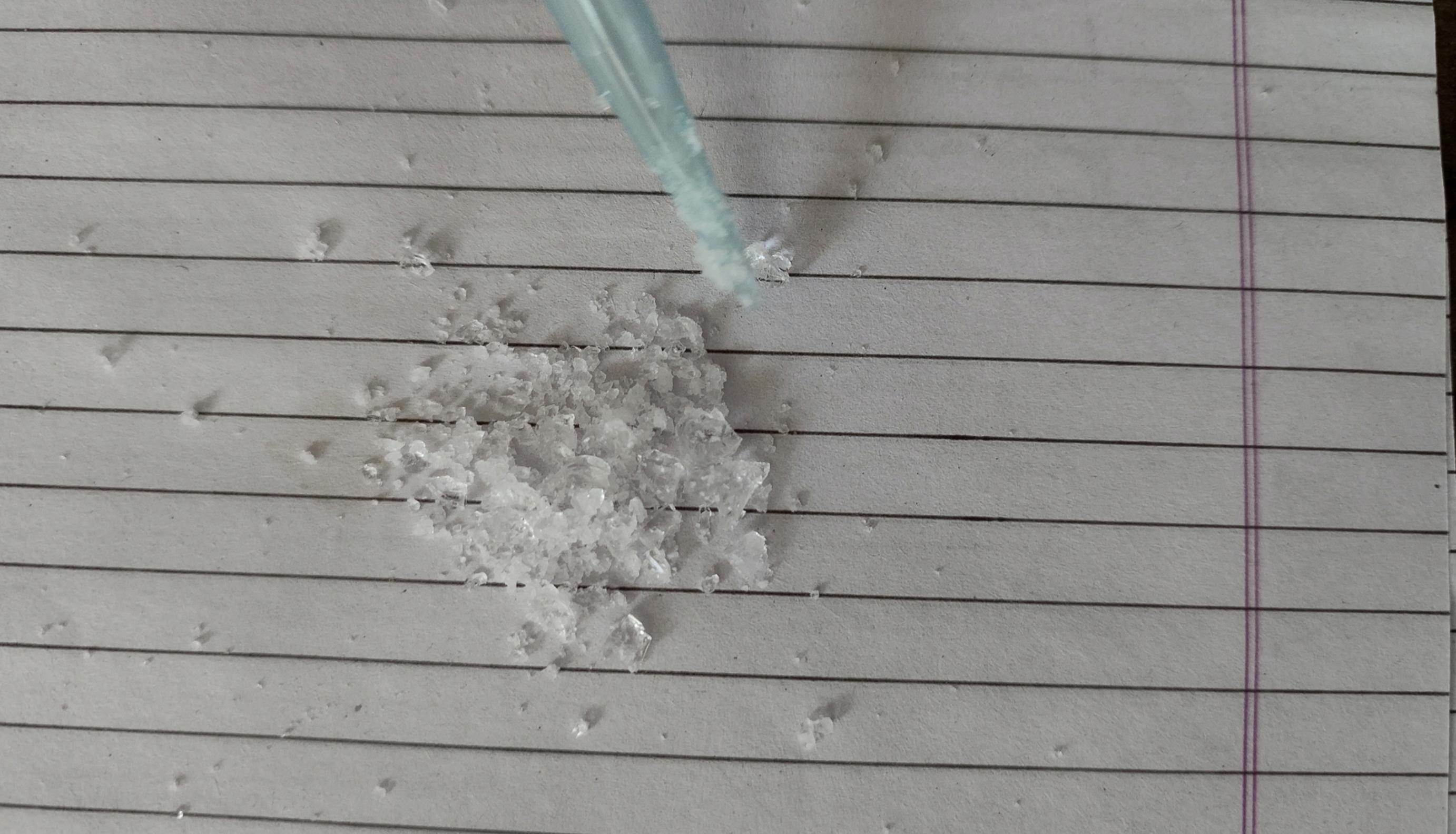
~~TEOS: 2.5mL + 11.5mL EtOH.~~

~~3.5mL  $\text{C}_2\text{H}_5\text{OH}$  + 5.5mL EtOH + 0.2mL SDA.~~

# Synthesized Aerogel

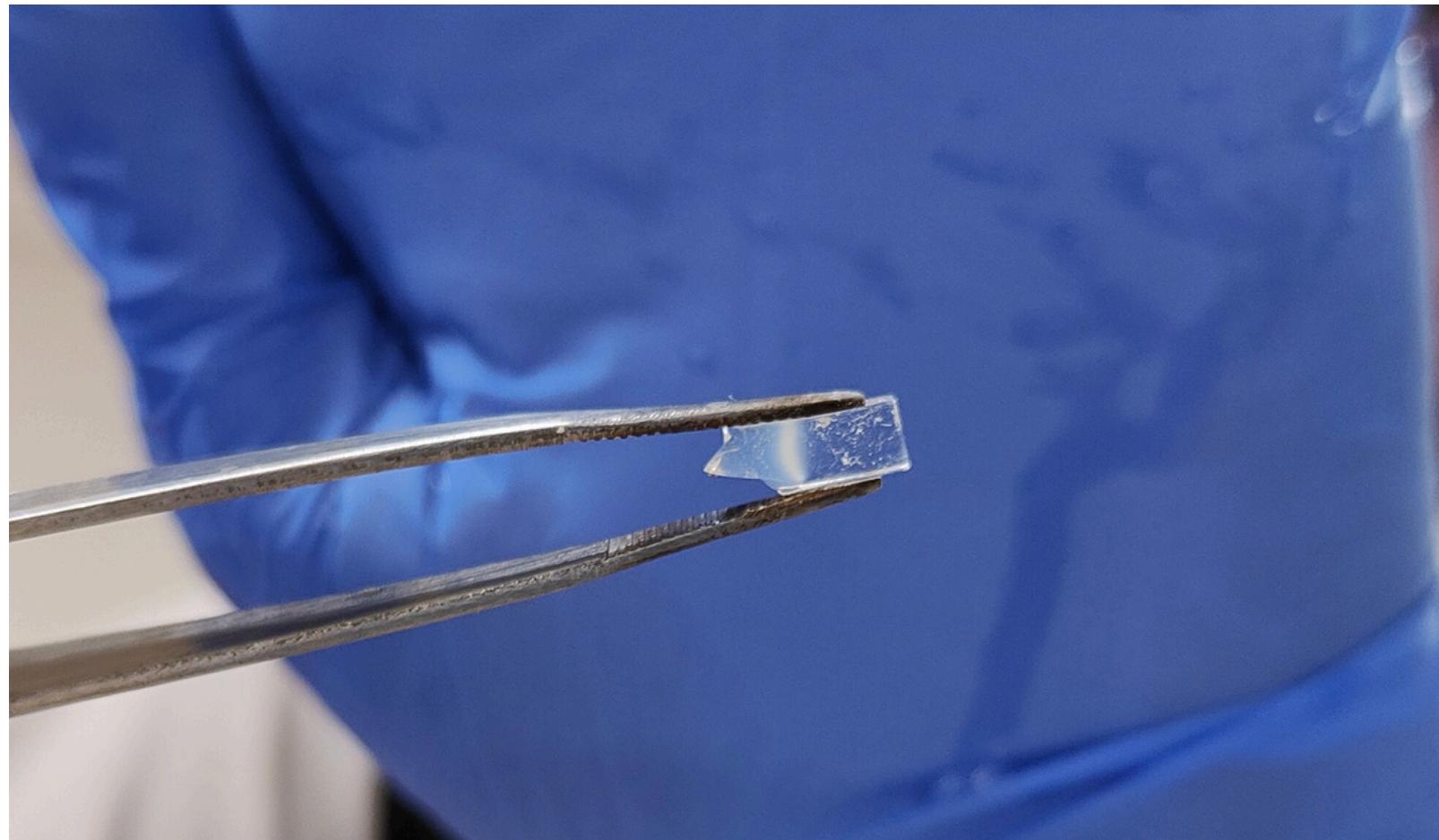


# Synthesized Aerogel



# Sample Preparation for Aerogel XRD Analysis

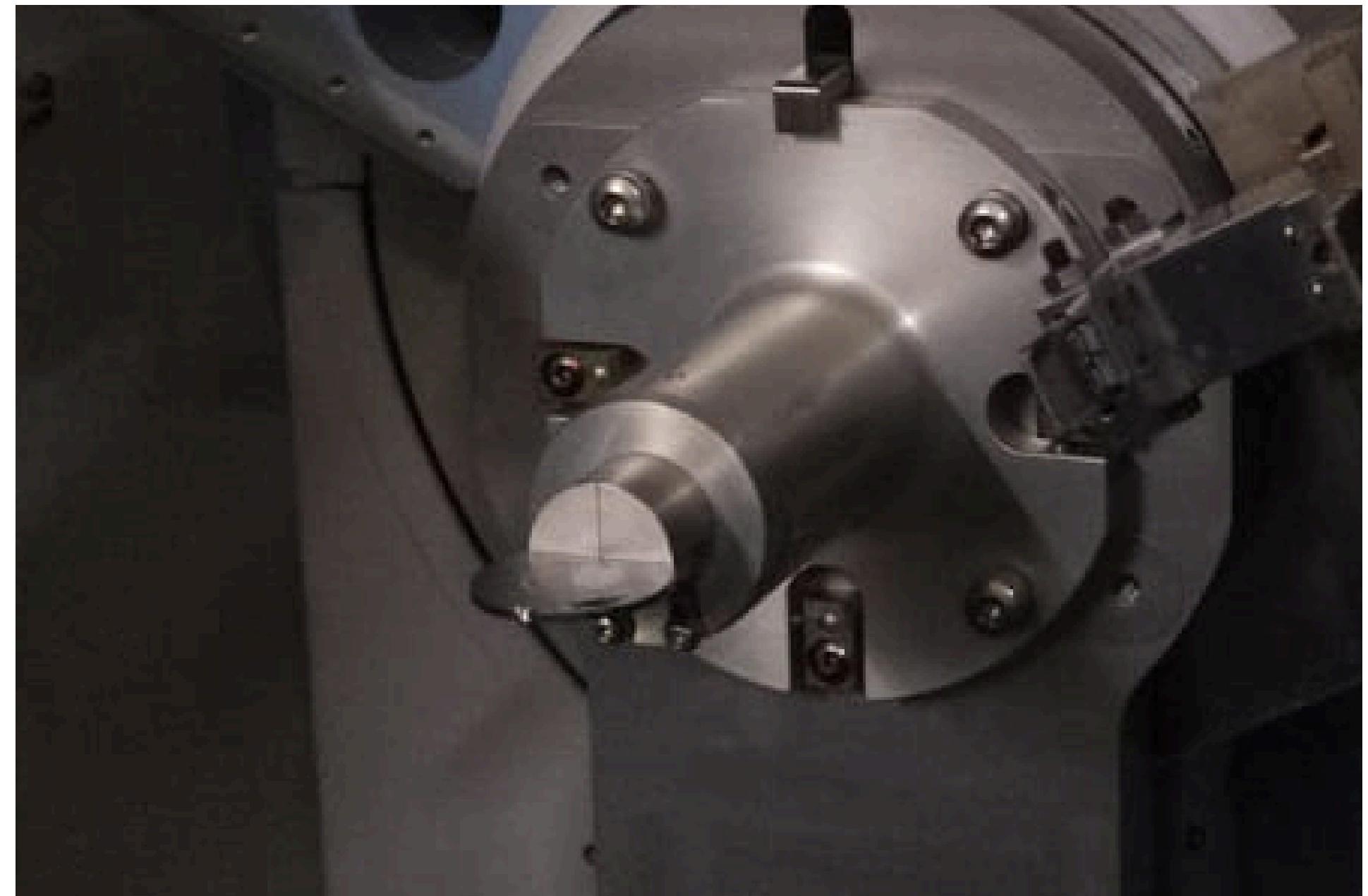
- The aerogel sample is first washed with methanol to remove the impurities.
- The washed sample is carefully placed on the absorbing paper to absorb excessive methanol.



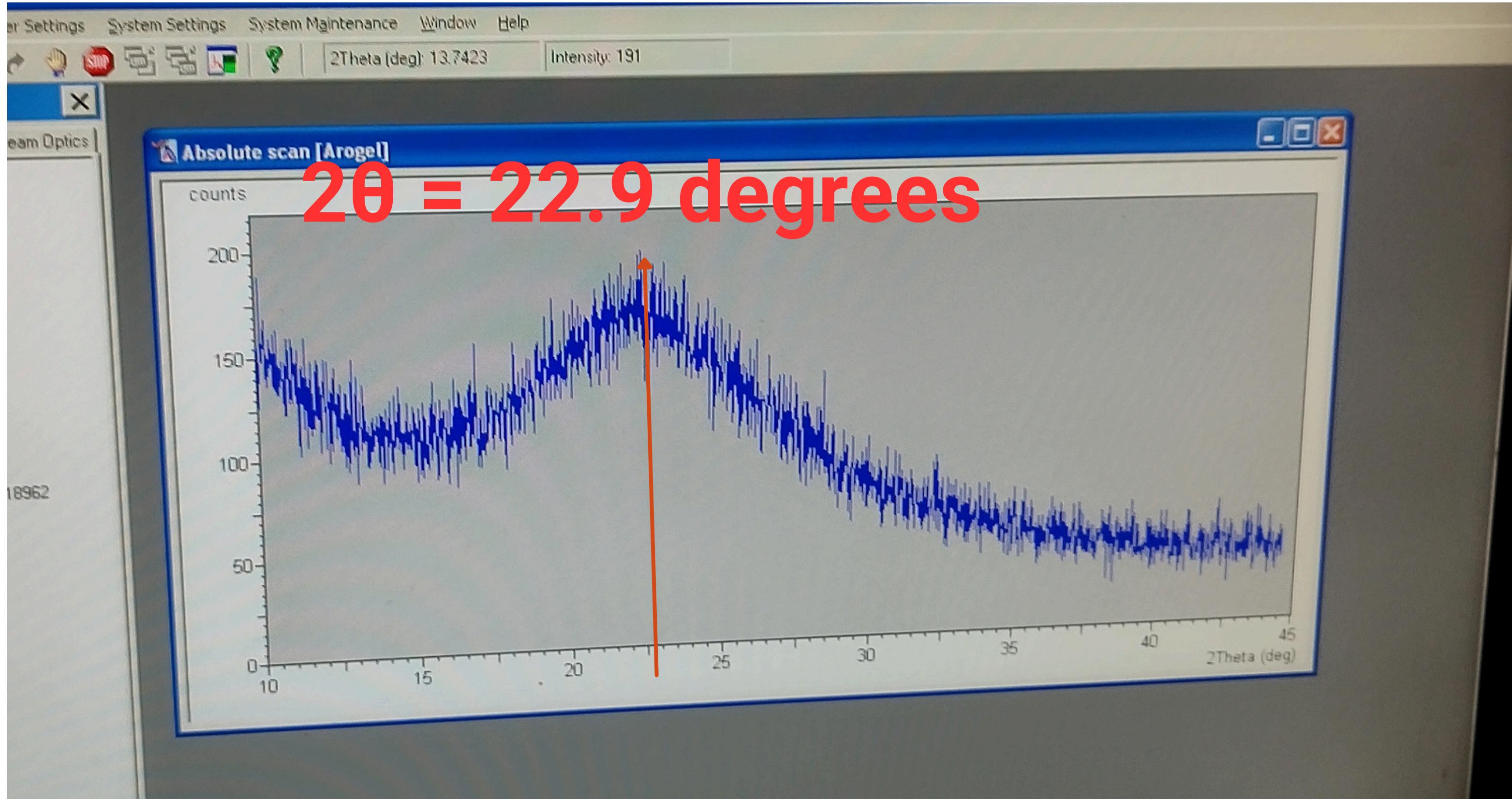
Washed Aerogel sample

# Sample Preparation for Aerogel XRD Analysis

- The sample is then crushed into fine powder.
- The prepared powder is then transferred into the sample holder of the XRD machine and placed carefully in the slot.
- The XRD is done over 20 degrees - 80 degrees.



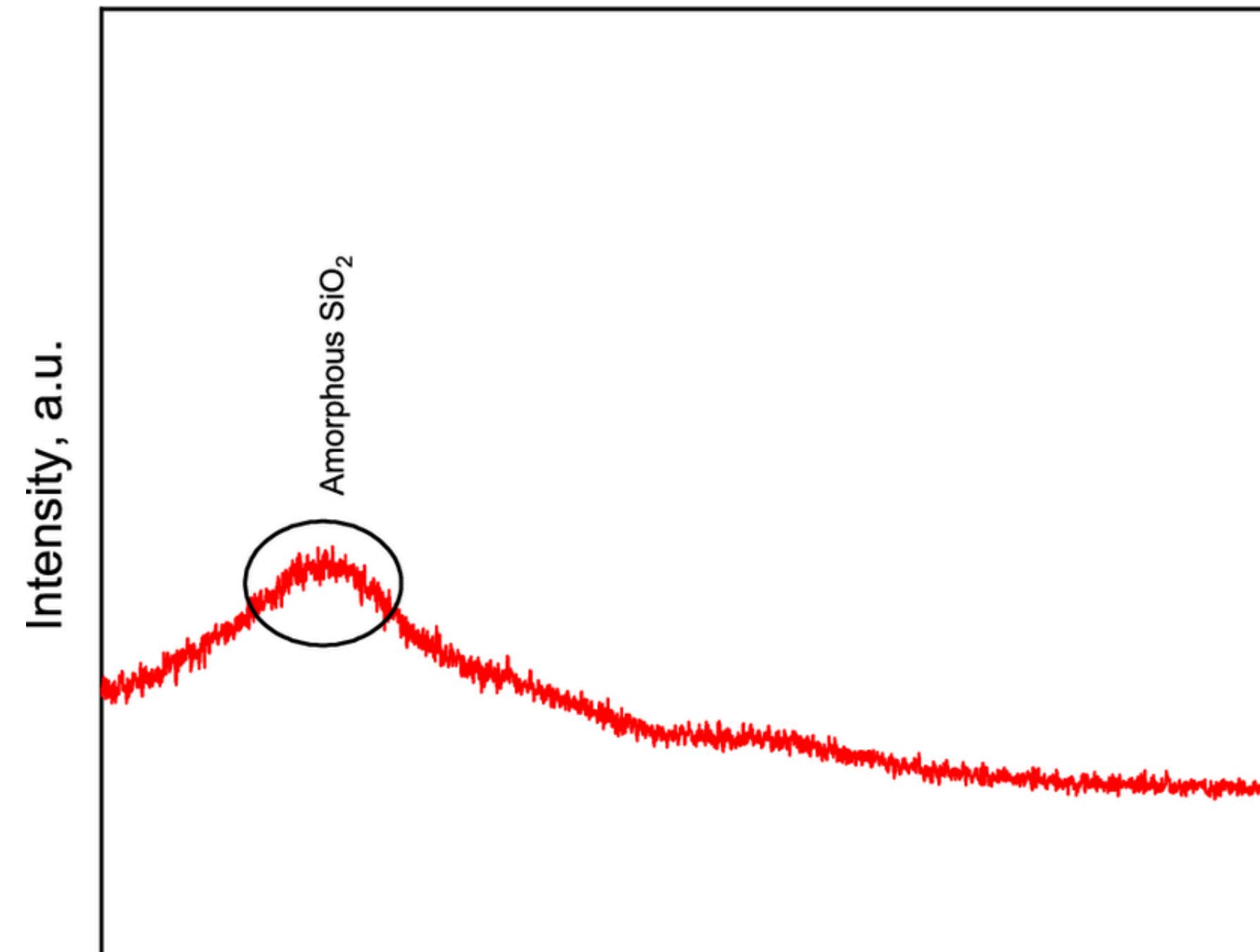
# X-Ray Diffraction (Practical)



Experimental graph obtained for XRD



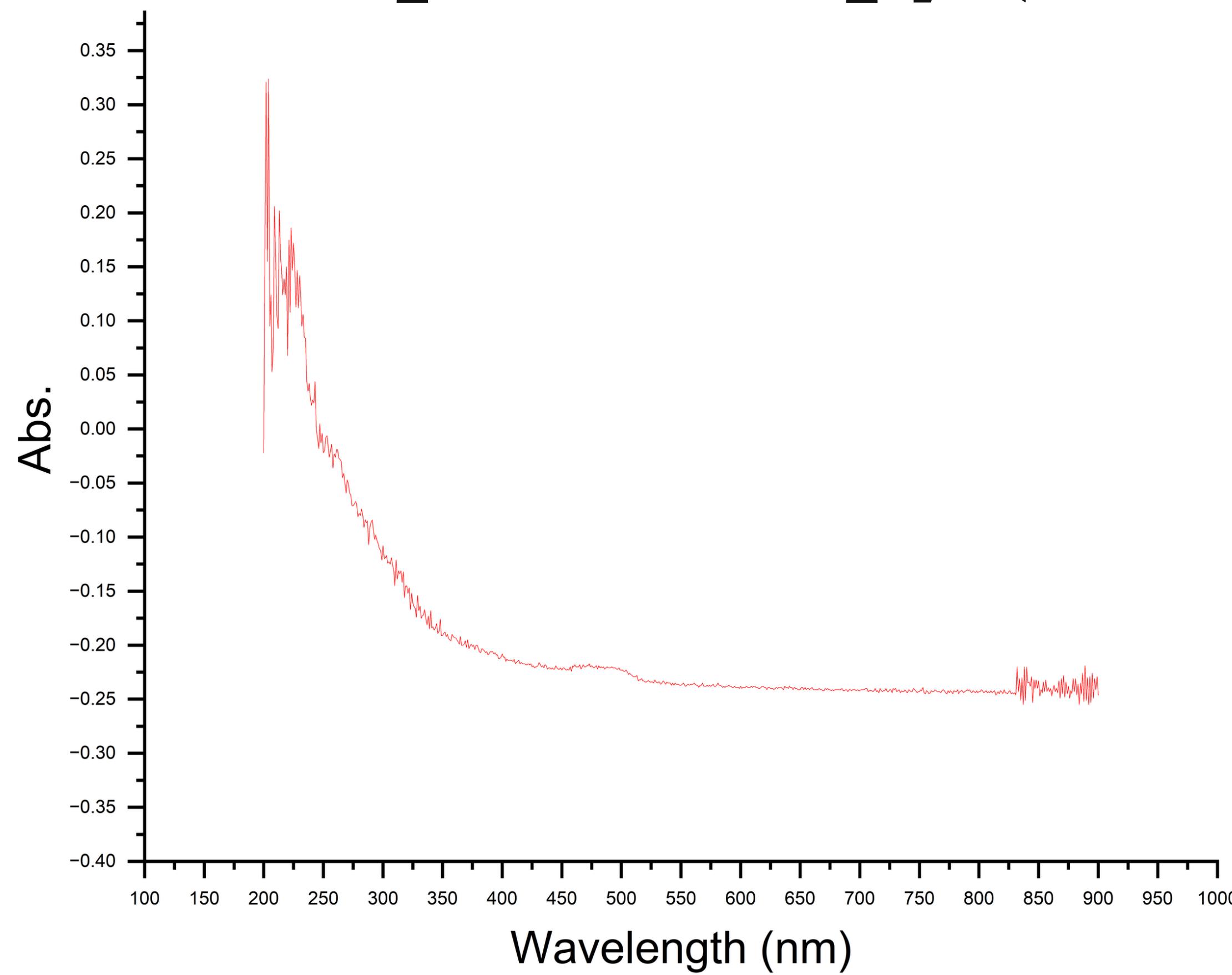
# X-Ray Diffraction (Theory)



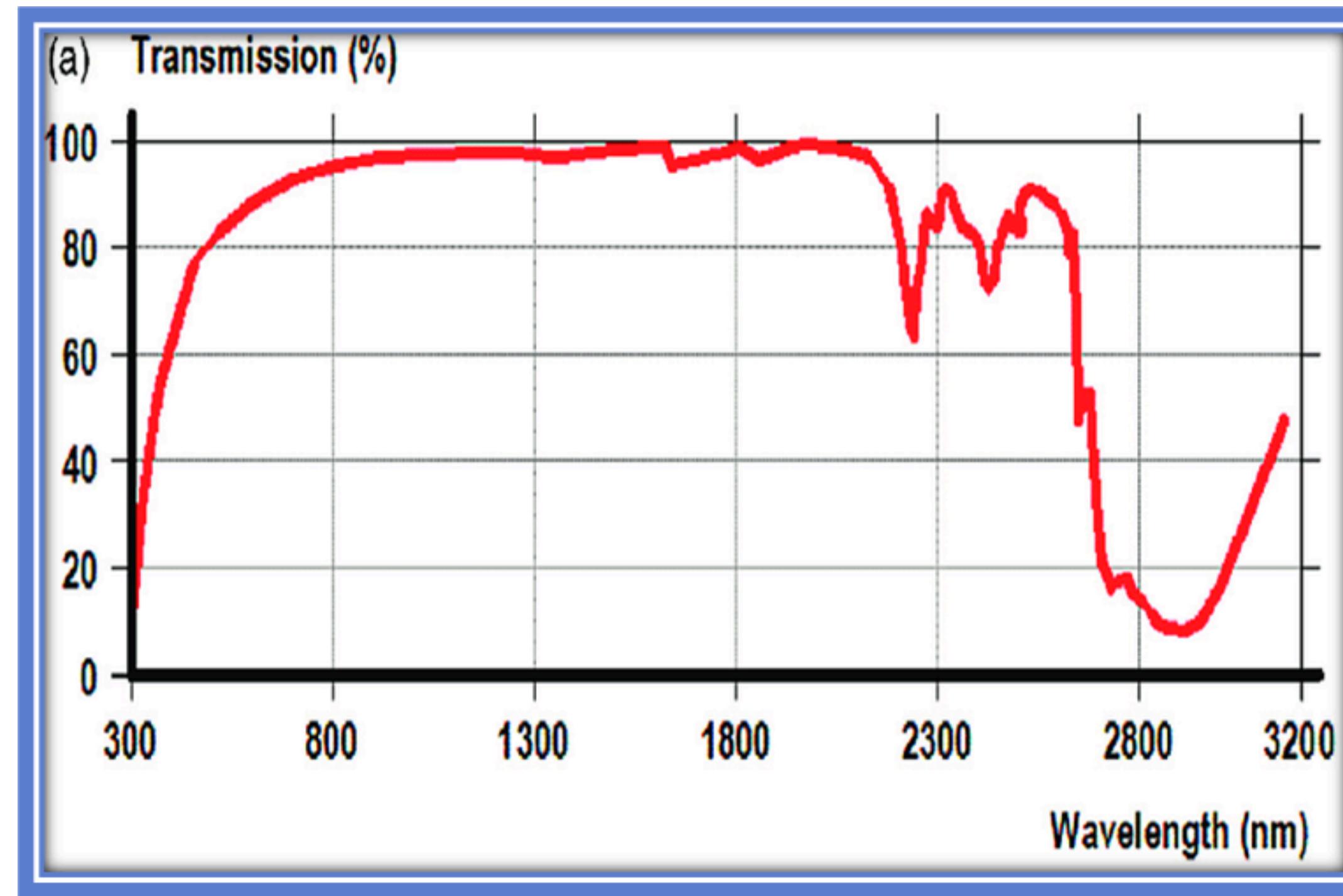
Practical reference data for Silica Aerogel XRD diffraction



# Uv- Visible Spectroscopy (Practical)



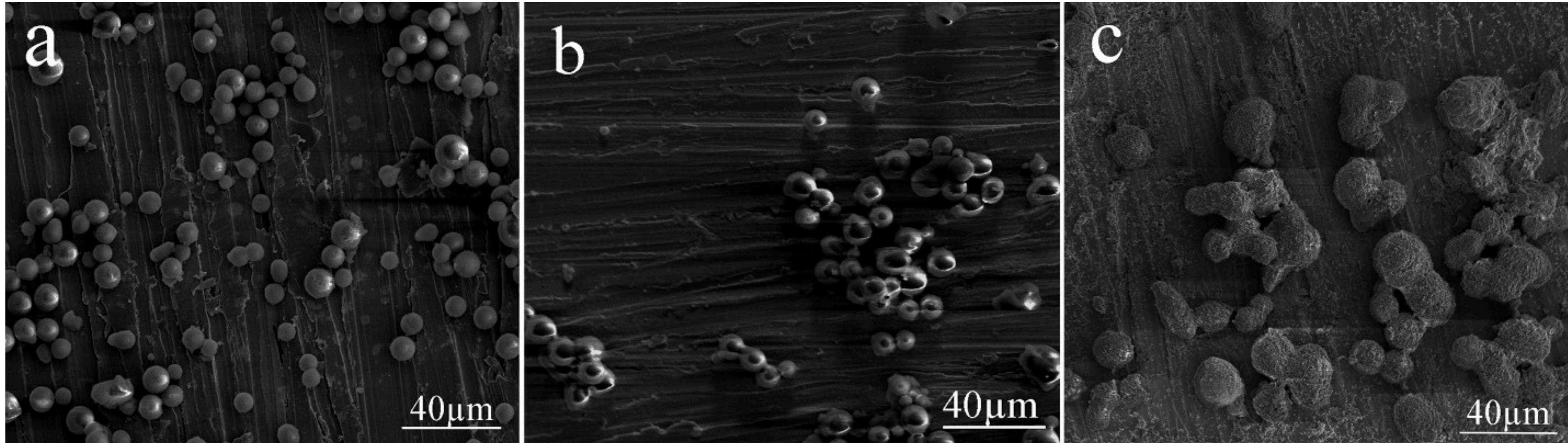
# Uv- Visible Spectroscopy (Literature)



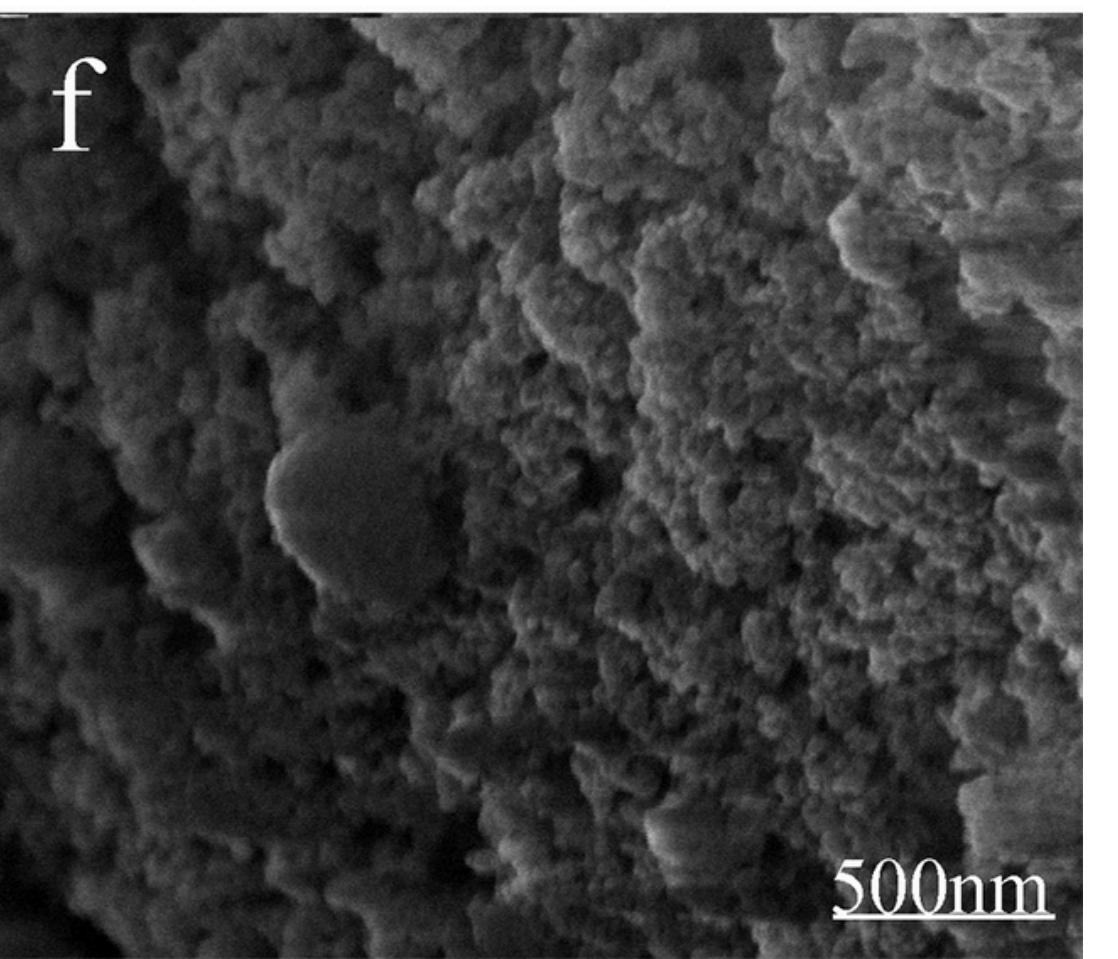
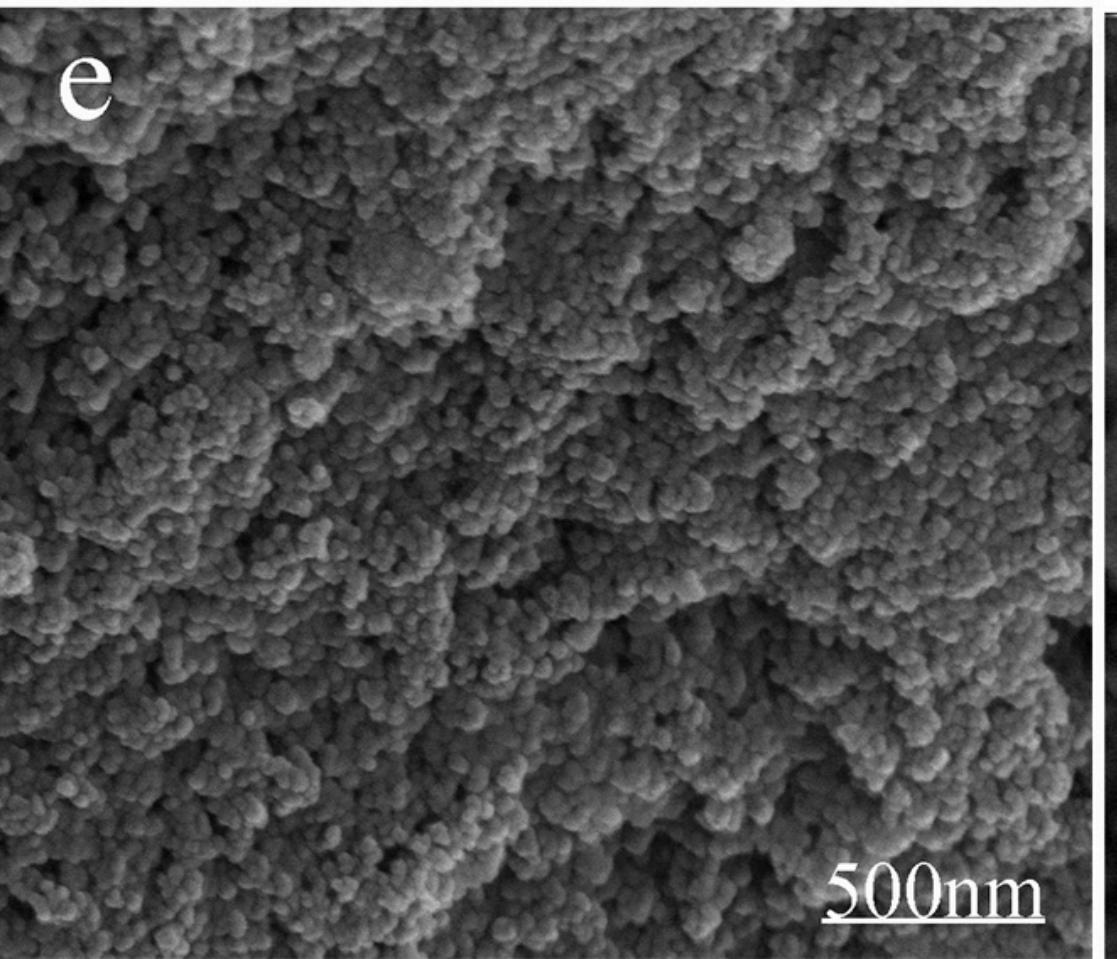
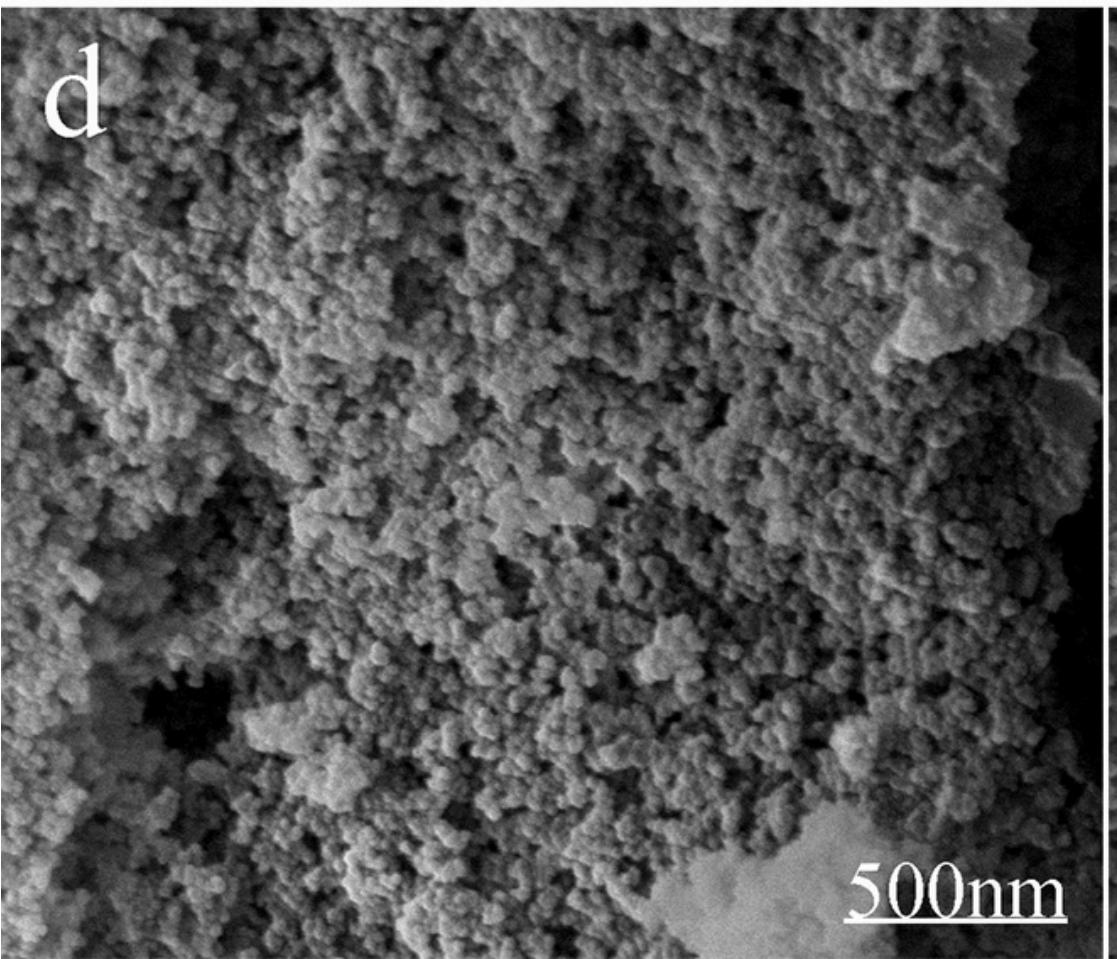
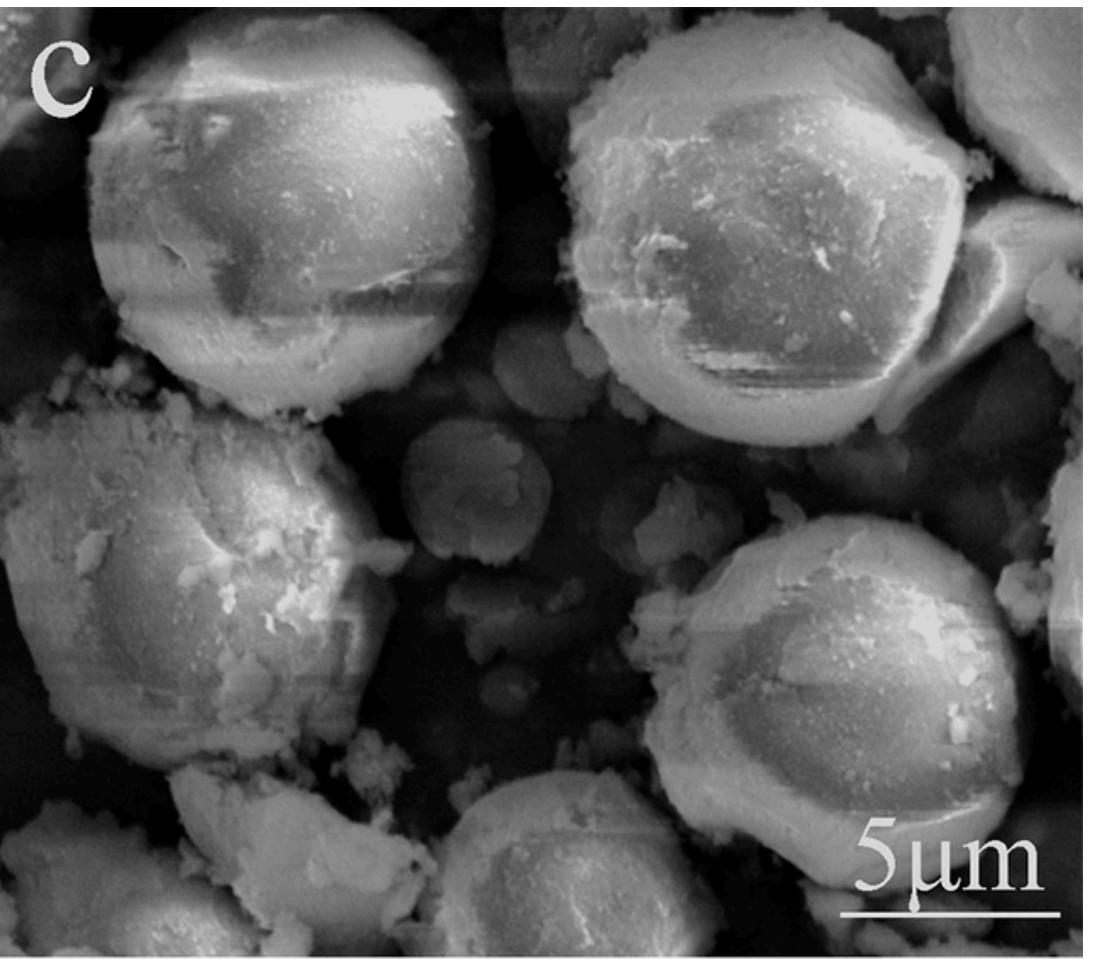
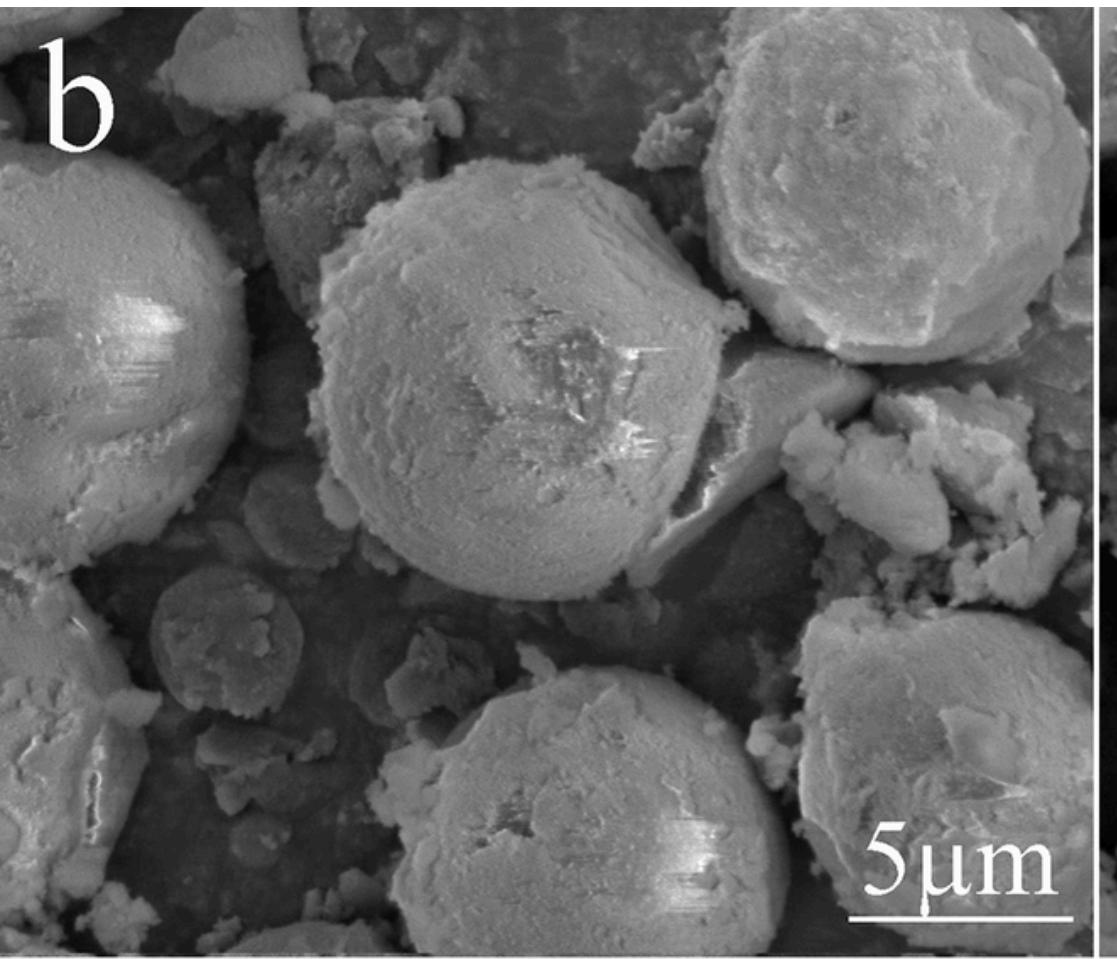
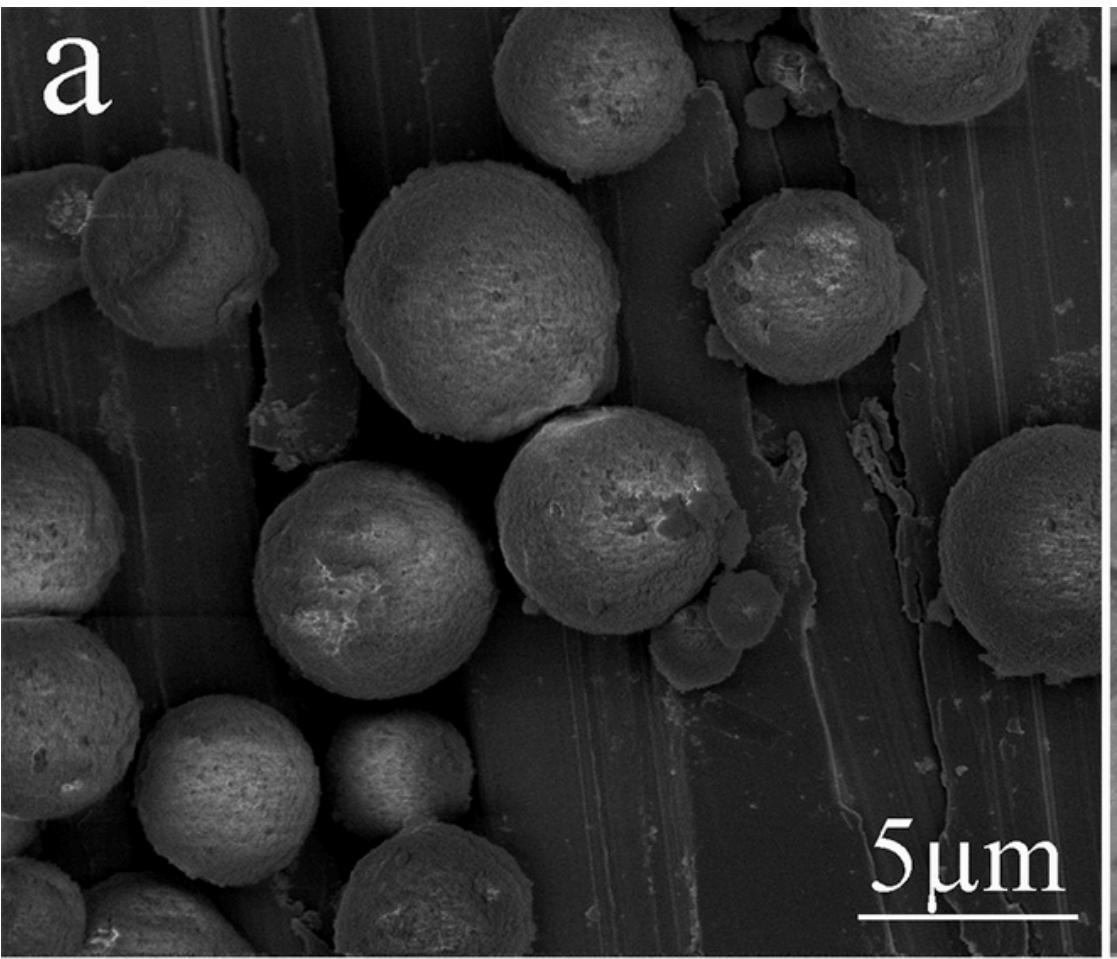
# Sample Prep of SILICA AEROGEL in SEM

- By using sharp blade or a clean razor to cut the silica aerogel into small pieces
- Place the cut silica aerogel sample on a suitable SEM sample stub using a conductive adhesive or double-sided carbon tape.
- Check the Vacuum Condition.
- Optimize the SEM parameters for imaging delicate and low-conductive materials.
- Capture SEM images at various magnifications to observe the microstructure of the silica aerogel.

# Sem Images of Silica Aerogel



SEM images of the silica aerogel microspheres prepared at different emulsifier concentrations: (a) 0.30 g/mL; (b) 0.50 g/mL; and (c) 0.70 g/mL.



**thank you**