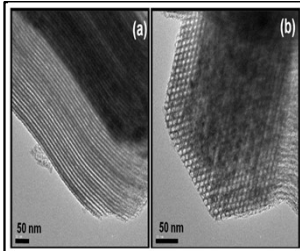


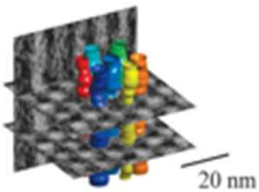
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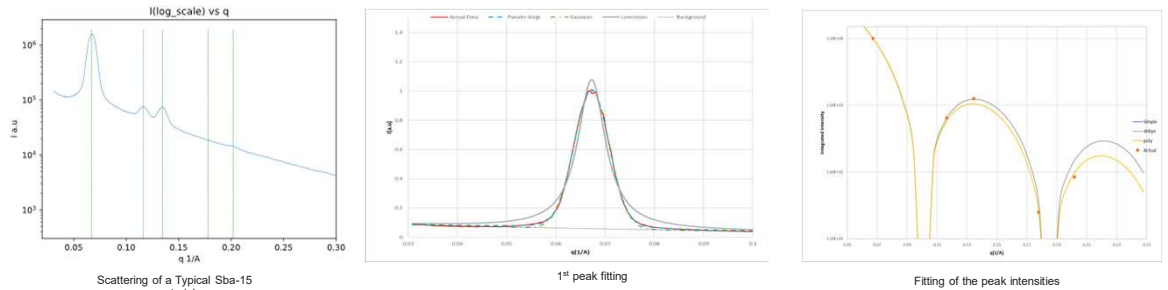
Typical TEM micrographs of SBA-15 mesoporous silica. [1]

SBA-15 is a silicious ordered mesopores material that contains some microporosity.



Cylindrical mesopores at small scale [2]

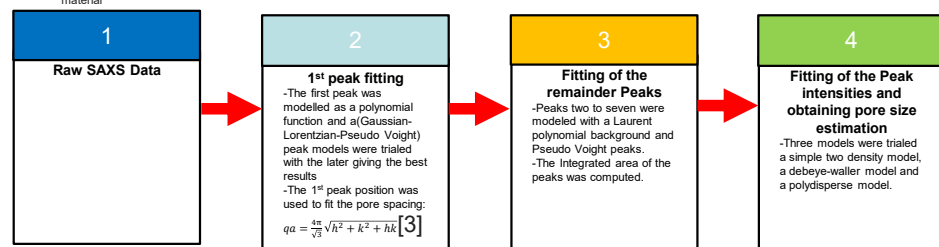
Pore size estimation from SAXS



Scattering of a Typical Sba-15 material

1st peak fitting

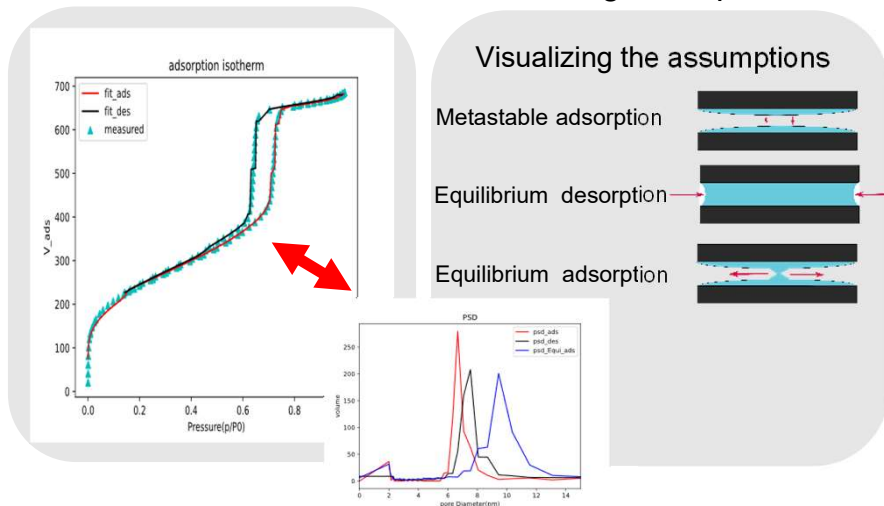
Fitting of the peak intensities



-The advantage of this method is the dependence on the structure of the material.

-Is it possible to obtain systematically consistent results from the analysis of the nitrogen sorption data?

Pore size estimation from Nitrogen sorption

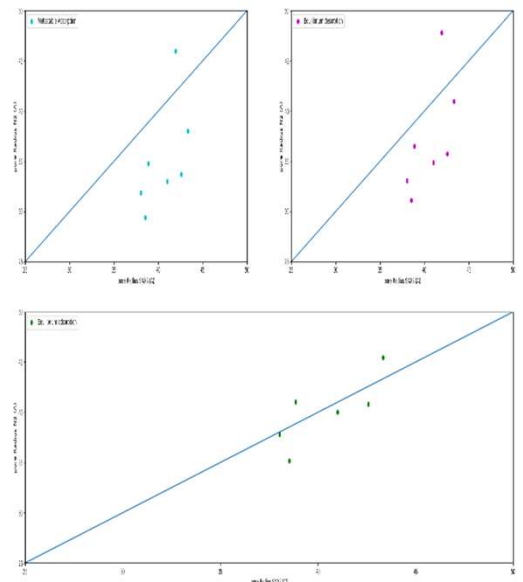


-N₂ adsorption isotherm is determined by measuring the volume adsorbed on the material at a certain relative pressure.

-The pore size distribution is obtained by utilizing DBD adsorption model and taking different assumptions to analyze the sorption data:

- Adsorption is the metastable branch.
- Desorption is equilibrium branch.
- Adsorption is equilibrium branch.

Comparing SAXS and Nitrogen Sorption results



-It is visible that fitting the adsorption branch as the equilibrium branch consistently gives the most accurate results. (The SAXS pore size is from pseudo voigt/polydisperse model)

Conclusions

-Assuming adsorption as metastable and desorption as equilibrium consistently underestimates the pore size.

-Assuming the adsorption branch as equilibrium branch systematically gives a better pore size estimation.

Prospects

-Can we see capillary bridges in unsaturated mesopores using scattering methods ?

-Can contrast matching be utilized in this aim?

References

- [1] R. Huirache-Acuña et al., "SBA-15 Mesoporous Silica as Catalytic Support for Hydrodesulfurization Catalysts—Review," *Materials*, vol. 6, no. 9, pp. 4139–4167, Sep. 2013, doi: 10.3390/ma6094139.
- [2] Gommès et al. "Quantitative characterization of pore corrugation in ordered mesoporous materials using image analysis of electron tomograms" *Chem. Mater.* 21 (2009), pp. 1311-1317
- [3] M. Impéror-Clerc, P. Davidson, and A. Davidson, "Existence of a Microporous Corona around the Mesopores of Silica-Based SBA-15 Materials Templated by Triblock Copolymers," *J. Am. Chem. Soc.*, vol. 122, no. 48, pp. 11925–11933, Dec. 2000, doi: 10.1021/ja002245h.