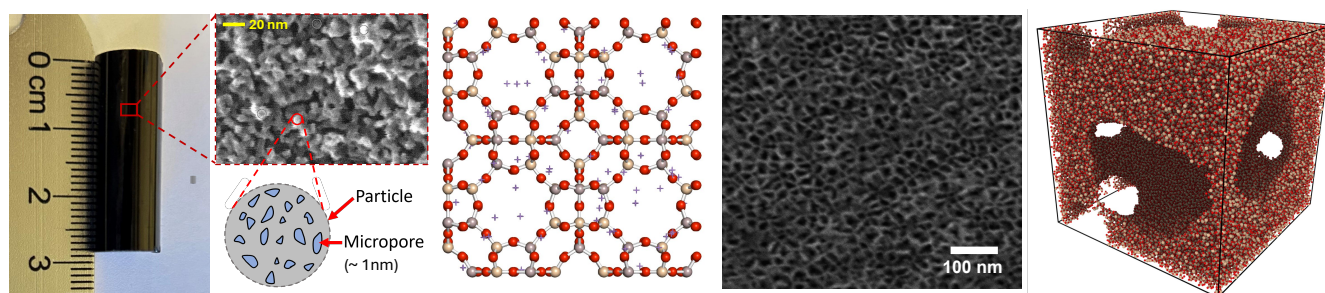


ChE 777: Adsorption and Nanoporous Materials

Fall 2026, Fridays 1:00-3:50 PM, FMH 110

Adsorption plays key roles in vital chemical engineering processes such as gas purification, carbon capture, and catalysis, where efficiency and selectivity determine performance and sustainability. Nanoporous materials is central to adsorption because they enable selective separation and storage at the molecular scale. Understanding adsorption phenomena also advances the design of new materials for energy storage and environmental applications. Adsorption science connects fundamental thermodynamics and transport with practical technologies that shape modern chemical engineering.



The course includes the following topics:

1. Thermodynamics of gas adsorption
2. Nanoporous materials and their applications
3. Nitrogen adsorption, BET surface area, pore size distribution
4. Thermodynamics of nanoconfined phases
5. Kinetics of gas adsorption
6. Adsorption-induced deformation
7. Sorption in polymers

Additional outcome: The final project will be implemented in groups, and completed projects can potentially result in journal publications. The final projects from the different graduate elective course, taught by the same instructor, ChE 775 in 2020 and 2022, led to papers published in *J. Phys. Chem. B* <https://doi.org/10.1021/acs.jpcc.0c10505> and *ACS Appl. Mater. Interfaces* <https://doi.org/10.1021/acsami.3c02713>

Prerequisites: The course requires background in thermodynamics at the graduate level (ChE 611, MTSE 602 or similar), and background in math (ChE 626 or similar, or undergraduate course on differential equations). The students are expected to be proficient with software for engineering calculations and plotting (preferably Python or Matlab, at minimum Excel).

Who should enroll: The course is designed for **Ph.D. students**. Outstanding MS or BS/MS students in physics, chemistry, and engineering can reach out to the instructor for permission to register. The syllabus draft is available here: <http://web.njit.edu/~gor/Gor-ChE777-2026.pdf>

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