
MECHANICAL ENGINEERING STUDENT SEMINAR

Sunday, May 11, 2025, at 12:30, D. Dan and Betty Kahn Building, Room 217.

Microfabrication of Gold Grids for Cryogenic Transmission Electron Microscopy

Advisor: Asst. Prof. Leeya Engel

Microfabrication of gold electron-microscopy (EM) grids offers a robust platform for enabling sub nanometer resolution imaging via transmission electron microscopy (TEM). I will begin the presentation with a brief review of the history of microfabrication from early semiconductor lithography to microelectromechanical systems (MEMS) and describe the key processes of photolithography, thin-film deposition, and etching that yield precise, reproducible patterns. I will then motivate the necessity of EM by contrasting its resolving power with that of optical microscopy and by summarizing fundamental principles of TEM and scanning electron microscopy (SEM). I will describe the design criteria for EM grids, which must combine mechanical rigidity, electrical conductivity, and minimal beam-induced motion. The core of the talk details a novel, two-mask fabrication workflow developed on 4" SiO₂ wafers, which employs a lift-off protocol followed by gold electroplating to produce hundreds of grids per wafer using standard and widely available equipment and fabrication processes. Performance data demonstrate that these grids meet the quality of commercially available supports while offering improved scalability and cost-efficiency. The presentation concludes with a comparative analysis of current state-of-the-art grid fabrication approaches versus the process we developed.

Note: the seminar will be given in English