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Single crystal silicon nanomembrane molecular sieves

Silicon nanomembranes are thin suspended sheets of crystalline silicon, with thicknesses smaller than a micrometer and areas exceeding thousands of square micrometers. We have developed an inexpensive method to fabricate flat, ultrathin membranes that are robust and suitable for implementing in micro-electromechanical systems (MEMS) and microfluidic devices. Patterning the nanomembranes enables additional applications such as molecular sieving and detection, alignment of high aspect ratio nanoparticles and pattern transfer through nanoscale shadow masking. Our process allows for the customization of pore shapes in a nanomembrane by adapting bulk micromachining processes and utilizing them to create nanoscale pores. While the separation of microscopic objects by size has been studied for decades, the more difficult problem of separating similarly sized objects with different shapes has gained interest over the last several years. Shape selective techniques are particularly important in the manipulation and detection of high-aspect-ratio particles, from nanowires and nanotubes to microbes such as *E. Coli.* We describe how such objects can be separated and spatially manipulated using nanopatterned sieves fabricated from single crystal silicon nanomembranes.

Gokul Gopalakrishnan
University of Wisconsin, USA

Biography

Gokul Gopalakrishnan has a PhD in Physics from the Ohio State University, studying electron transport in low dimensional systems. As a postdoctoral fellow at Harvard University, he investigated the metal-insulator transition in thin film and nanostructured vanadium dioxide. At the University of Wisconsin-Madison, he has developed x-ray scattering tools to probe phonons in nanostructures. Currently, at the Engineering Physics Department at the University of Wisconsin-Platteville, he is creating techniques to fabricate crystalline semiconductor nanostructures for MEMS and biomolecular sensing.

gopalakrishg@uwplatt.edu