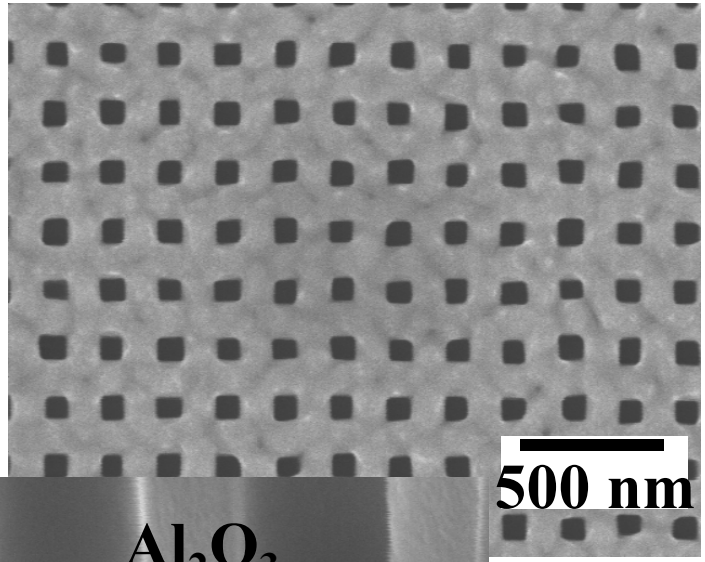
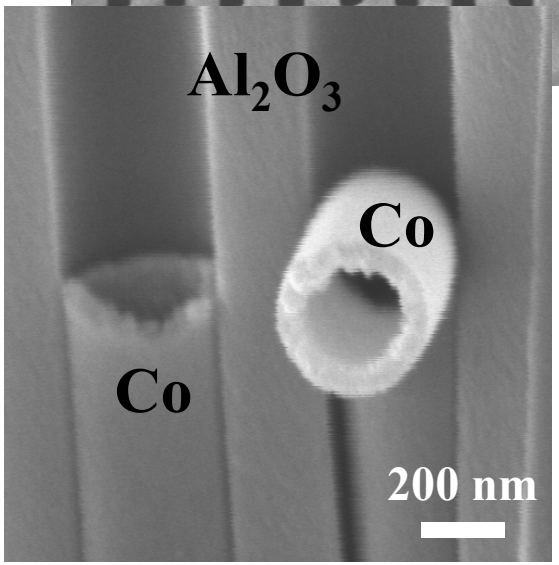
Nanostructured Surfaces with Long-range order for Controlled Self-Assembly

C.A. Ross, H.I. Smith, C.V. Thompson, F.M. Ross; MIT and IBM, DMR0210321, 8/1/2002 – 7/31/2006

This project develops methods and processes to **control the position and geometry of arrays of nanostructures over large areas with precise long-range order** ("templated self-assembly"). An example is the growth of anodic alumina films. Alumina films contain an arrangement of pores which lack long range order. We have developed a way of templating the pores, for instance to form a regular square array (top figure). Such pore arrays can provide a matrix for the growth of functional nanostructures such as magnetic tubes (bottom figure). We are also looking at several other examples of self-assembly, including SiGe quantum dot growth, block copolymer ordering, and the islanding of metal films, all of which can be templated by appropriate substrate patterning.





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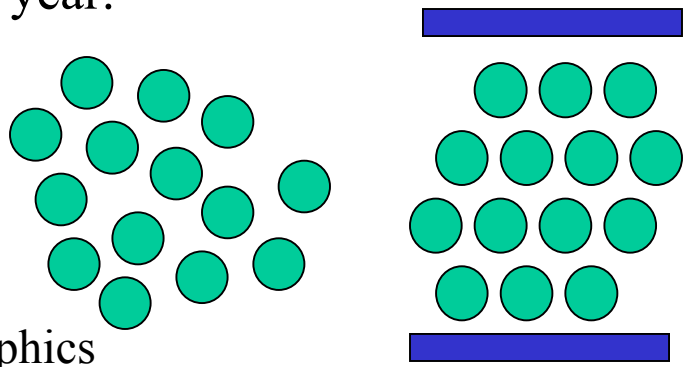
Education:

Two graduate students (Mike Walsh, Amanda Gierman) and two postdocs (Joy Cheng and Kornelius Nielsch) have been supported, plus an undergraduate researcher (Mariana Shnayderman). Work has been highly interdisciplinary, e.g. Kornelius has spent time at IBM performing measurement of quantum dot growth in an in situ microscope.

Outreach:

Working with Felice Frankel, a science communicator/artist at MIT, Mariana has been developing a set of animations designed to explain the concept of templated self-assembly to the public. This will be placed on a website in the coming year.



Left: self assembly; right: templated self assembly. Graphics from animations.