

WORKSHOP “Use of nanofabrication techniques for real examples in Nanotechnology”

1. Form six four-student groups.
2. Discuss in your group how you would fabricate the assigned nanodevice.
3. Your group will have to show the other students your response.
4. Afterwards, you have to make comments to the presentation of other groups.

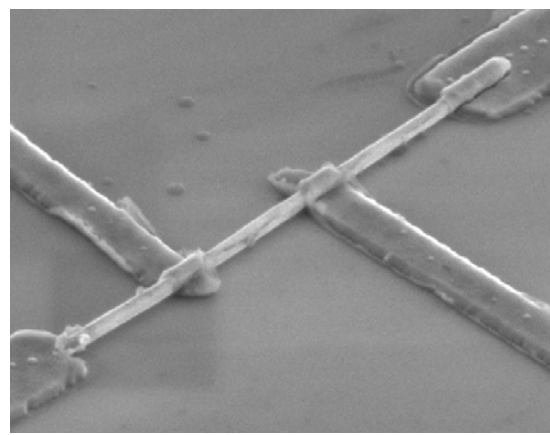
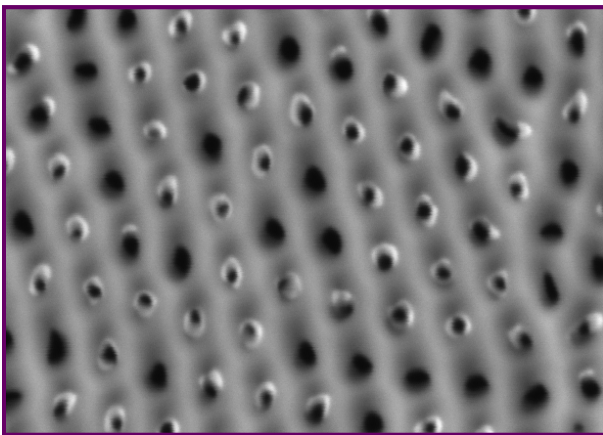
Tips:

-Discuss various strategies, stressing the pros and cons

-Be as specific as possible in the description of the process steps, the type of substrate, the type of equipment, type of measurement, etc.

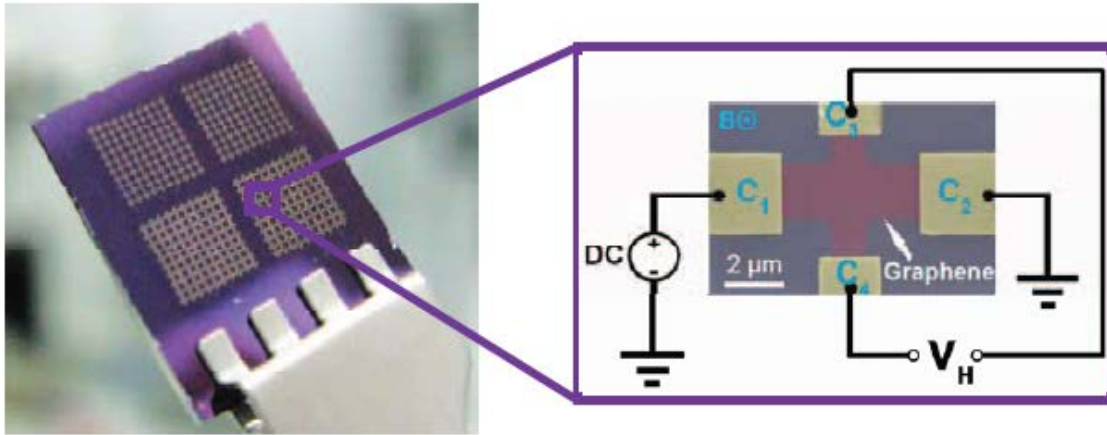
Group 1.- Measurement of the resistance of a metal nanowire:

Describe a process to fabricate four electrical contacts to a metallic nanowire (Au, Ag, Ni, etc.) to measure its electrical resistance. The nanowires are grown inside an alumina or polycarbonate membrane and are 5 μm long. Describe the potential problems.



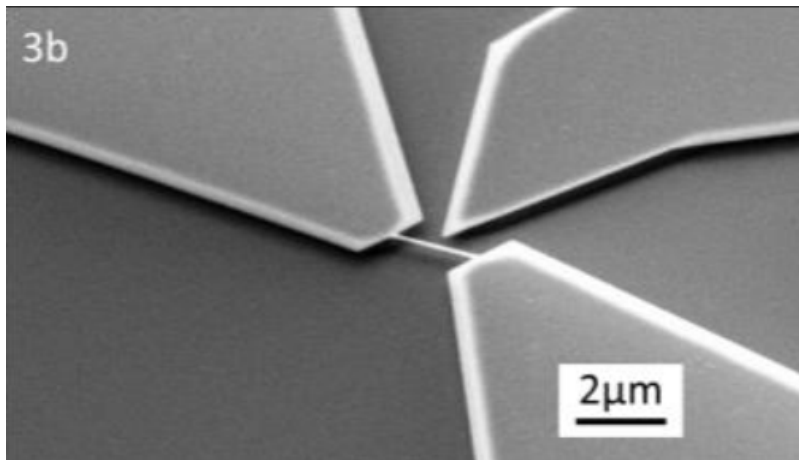
Group 2.- Graphene Hall bar for metrology application:

You want to fabricate a graphene Hall bar for metrology using the Quantum Hall effect. What graphene growth technique will you use? What lithography technique will you use? Please, be aware that you are also requested to fabricate a gating terminal in order to tune the carrier concentration. Describe the potential problems.



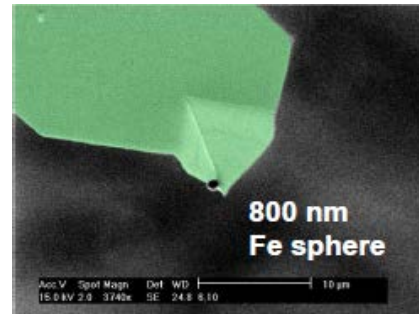
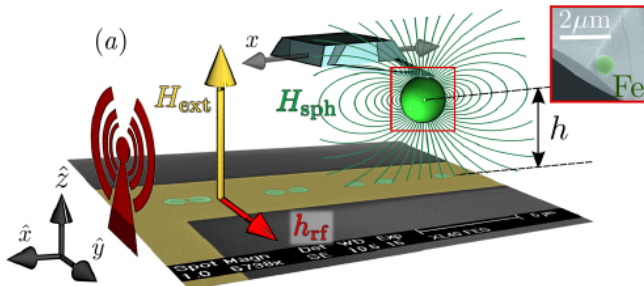
Group 3.- Piezoresistive suspended nanowire for sensitive mass detection:

You want to fabricate a small piezoresistive nanowire whose conductance will change when deformed, for example upon mass deposition on top of it. What material would you use? What lithography technique would you use? Describe the potential problems.



Group 4.- Fabrication of magnetic cantilevers for Ferromagnetic Resonance Force Microscopy (FMRFM):

You want to perform FRMFM measurements on a small magnetic nanostructure to investigate locally its spin dynamics. You need to fabricate a magnetic cantilever as that shown in the image. Which technique would you use for that fabrication? Describe the potential problems. How would you increase the lateral resolution? And the magnetic signal-to-noise ratio?



Group 5.- Fabrication of gold nanogaps for plasmonic experiments:

You want to perform plasmonic experiments and you need to fabricate gold gaps as small as possible, as shown in the image. Which techniques can you use for that fabrication? Which substrate would you use? What technique would you use if you need three-dimensional gaps? Describe the potential problems.



Group 6.- Fabrication of holes in membranes:

You want to perform holes in a membrane for studies related to the transport of some molecules (such as DNA) through the holes. Which techniques can you use for that fabrication? What technique would you use if you aimed the smallest possible hole? What technique would you use for high throughput? Describe the potential problems in each case.

