Supporting Information for

Asymmetric immobilization of antibodies on piezo-resistive micro-cantilever surface

Dilip Kumar Agarwal [1,2*],Nidhi Maheshwari [1],Soumyo Mukherji [1,2,3] and V. Ramgopal Rao [1,2*]

[1]Centre of Excellence in Nanoelectronics, Dept. of Electrical Engineering, IIT Bombay, Mumbai, India
[2]Centre for Research in Nanotechnology and Science, IIT Bombay, Mumbai, India
[3]Department of Biosciences and Bioengineering, IIT Bombay, Mumbai, India

*Corresponding authors: rrao@ee.iitb.ac.in, dilip_agarwal@iitb.ac.in

1. **Sample preparation:**Inorder to characterize the silicon dioxide-p-polysilicon-silicon dioxide cantilever surface for surface modification and antibody immobilization, experiments were first performed on wafer surfaces and then results were emulated on cantilever surfaces. Prior to do this, p type (100), single side polished wafers were subjected to grow thermal oxide by using wet oxidation furnace. These oxide wafer surfaces were then diced in small pieces and placed in 4-Target Electron Beam Evaporation chamber to evaporate 20 nm of amorphous silicon on top of the oxide surface. The amorphous silicon deposited oxide surface along with the plane oxide surface were then kept inside the Hot Wire CVD chamber for NH_3 cracking treatment creating a nitride layer on top of the amorphous silicon surface as opposed to oxide surface.

   The HWCVD treated amorphous silicon surface (nitride) and plane oxide surface were used for XPS, Ellipsometry and contact angle measurements. Immobilization protocol was used to ascertain selective immobilization on nitride surface**.** Silicon dioxide-p-polysilicon-silicon dioxide cantilever surfaces were then modified with similar way in order to get silicon nitride-polysilicon-oxide surface. Asymmetric immobilization of antibody was performed on nitride surface against the oxide surface.

2. AFM characterization:
Atomic force microscopy was performed to capture surface changes during surface modification of HWCVD treated amorphous silicon (nitride) and antibody immobilization.

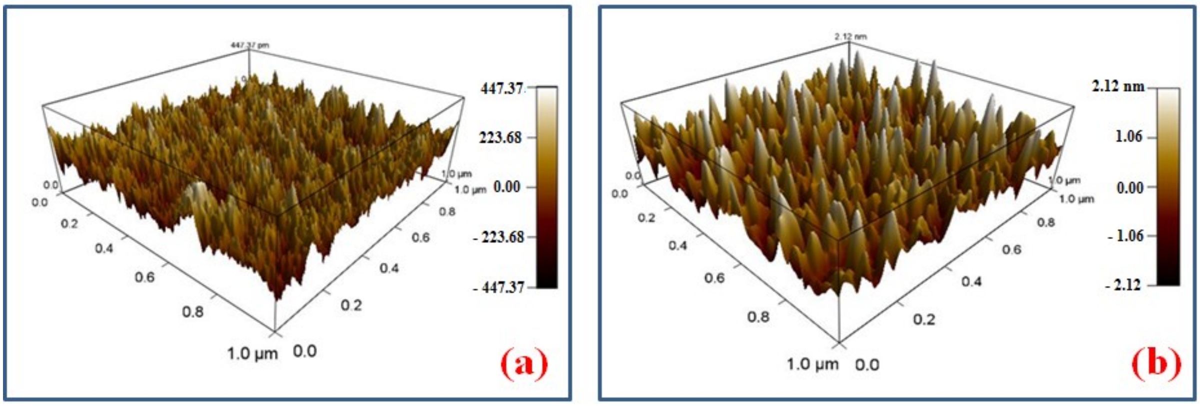

Fig. S1. AFM images of surface modification steps, (a) HWCVD treated amorphous silicon surface (nitride), (b) Antibody immobilized nitride surface

3. Ellipsometry results:
Ellipsometry was carried out to ascertain the formation of silicon nitride on top amorphous silicon deposited cantilever surface. The analysis was done by fitting the existing model (Cauchy-SiN) for silicon nitride with the theoretical model.

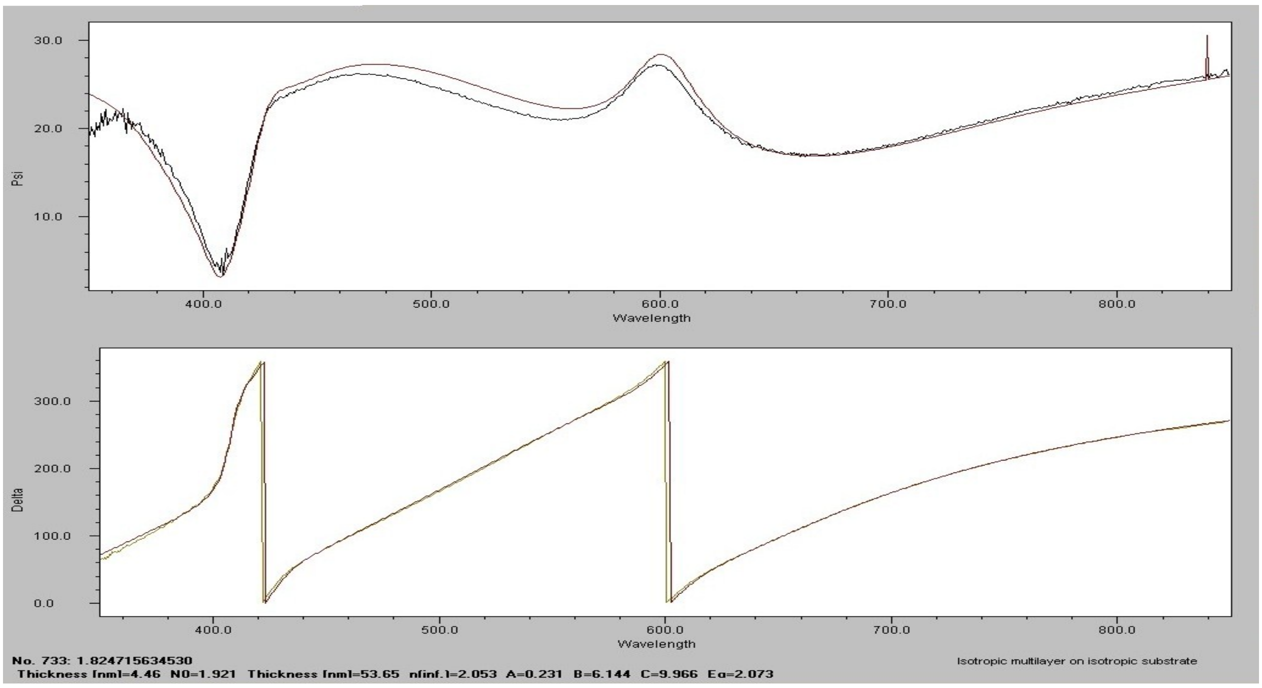

Figure S2. Ellipsometry characterization for thickness measurement of deposited nitride layer on amorphous silicon surface

4. Cross sectional FE-SEM: Cross sectional FE-SEM was performed to confirm the deposition of different layers on top modified oxide surface. The image shows four different layers comprising bottom silicon, thermally grown oxide layer and top amorphous silicon with nitride layer together. Due to very low thickness, we were not able to distinguish the separate nitride layer on top of the amorphous silicon film using cross sectional FE-SEM.

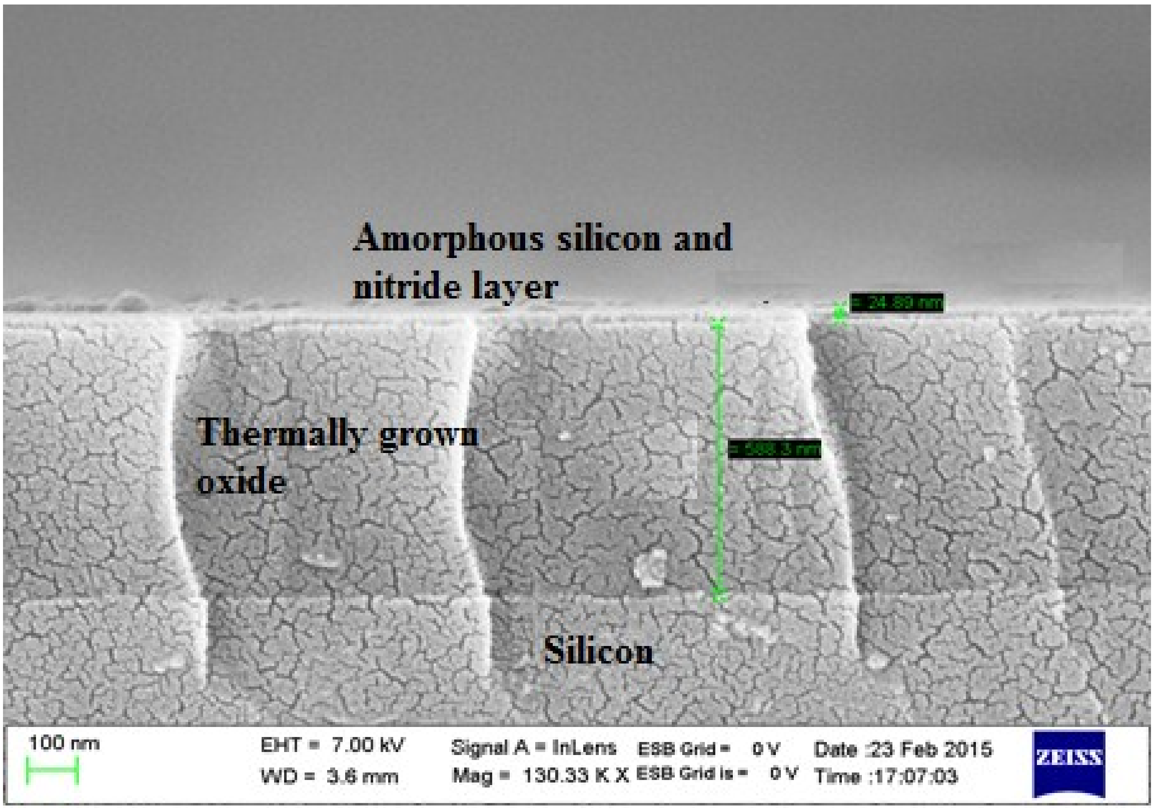

Figure S3. Cross sectional FE-SEM image showing deposition of different layers on oxide surface

5. Contact angle studies: Contact angle study was done on the modified amorphous silicon surface (SiN) and oxide wafer surface after hydrofluoric acid and glutaraldehyde treatment. On each surface, three water drops were put at different spots and contact angle was measured for each drop. The contact angle graph was plotted by taking the average value for each surface.