BE-2

August 2012 QE

The following ten questions are qualitative and examine your basic knowledge of BioMEMS, they all have short answers. If needed, you can draw a schematic to explain your answers.

1. Which is the following wet silicon etchants have the best p++ etch stop selectivity, EDP, KOH, or TMAH? ***(5 points)***

2. Gas phase isotropic silicon etch is frequently sued to release microstructures such as cantilever beams, what is the most common dry etch used for this purpose? ***(5 points)***

3. Name two biggest commercial markets for silicon inertial sensors? ***(5 points)***

4. Evaporation and sputtering are two common metallization methods used in MEMS and microfabrications, name two advantages of sputtering. ***(5 points)***

5. Name two advantages of flip chip bonding as compared to wire bonding. ***(5 points)***

6. Name two substrate bonding methods that can create a hermetic seal for a sensor that has to operate in liquid environment? ***(5 points)***

7. Which one has a higher Young's modulus, silicon or aluminum? ***(5 points)***

8. What is the name of a very popular polymer that can be deposited at low temperatures, is biocompatible, and has conformal coating. This polymer is used extensively in medical microdevice passivation and coating among other things? ***(5 points)***

9. Most physiological signal shave a low frequency spectrum 9<100 Hz), name one that is probably the highest (20-30 kHz)? ***(5 points)***

10. Why do we use Ag/AgCl electrode in most electrochemical measurements? ***(5 points)***

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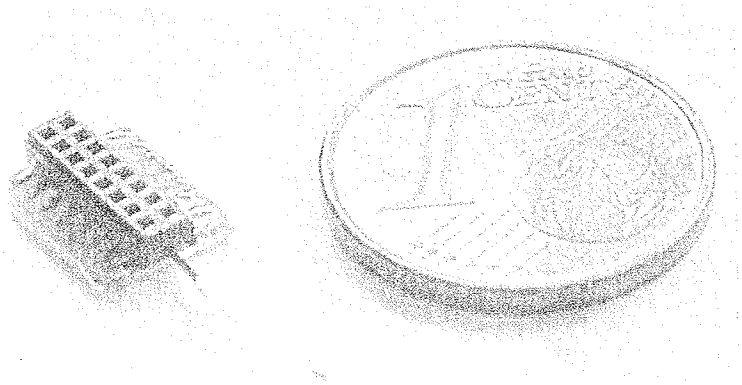
A) The following figure shows a polyimide recording electrode with Pt sites and interconnects, draw the fabrication sequence used to fabricate such probes, explain each step and count the total # of masks needed. *(20 Points)*



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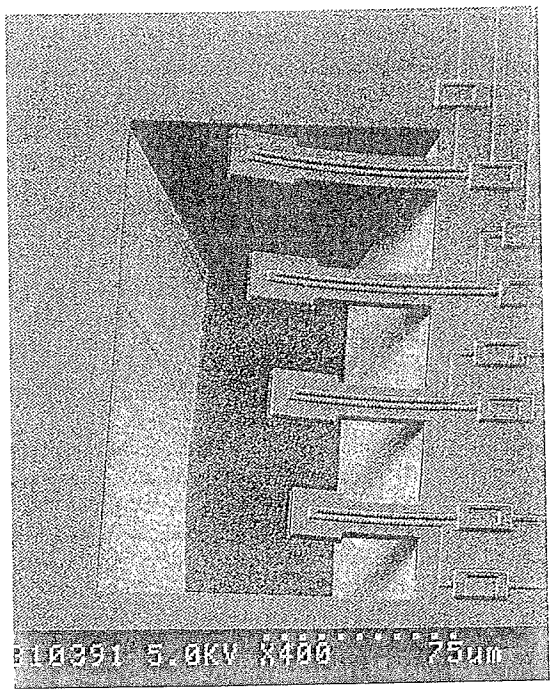
B) Why the following beams are curled up after release? Draw the beam cross section in the longitudinal direction and explain your answer clearly. *(15 Points)*



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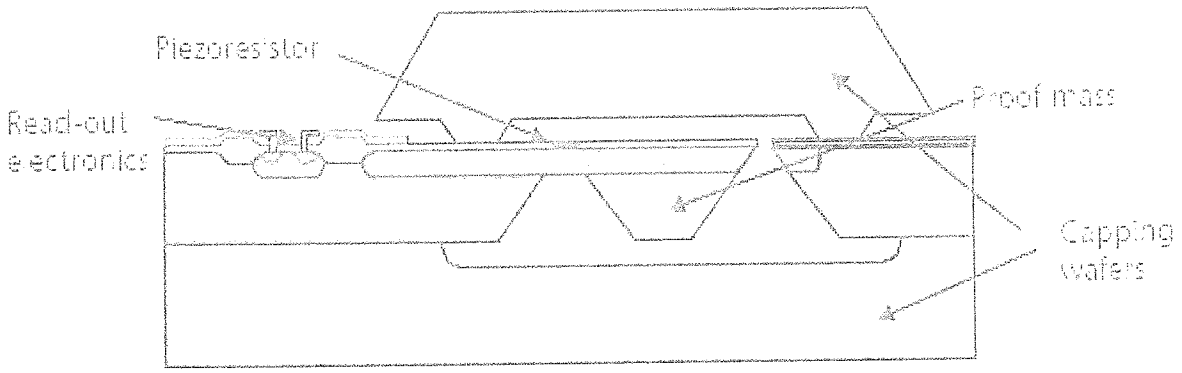
C) Figure below is a piezoresistive accelerometer, assume you want to place a piezoresistor on the sensor to measure deflection due to acceleration, where do you place the sensor for maximum sensitivity? Draw a top view and show the placement location. How do you place the sensor in that location for maximum sensitivity, Draw a top view and show the direction. ***(15 points)***



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