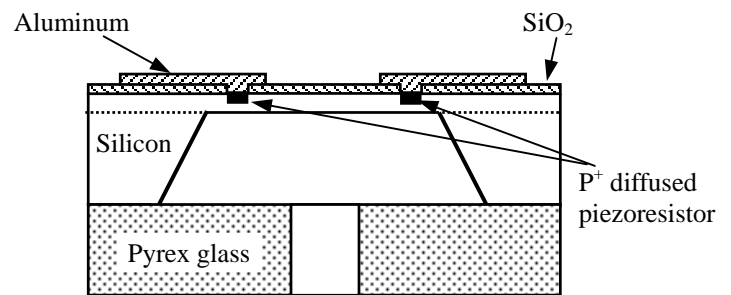
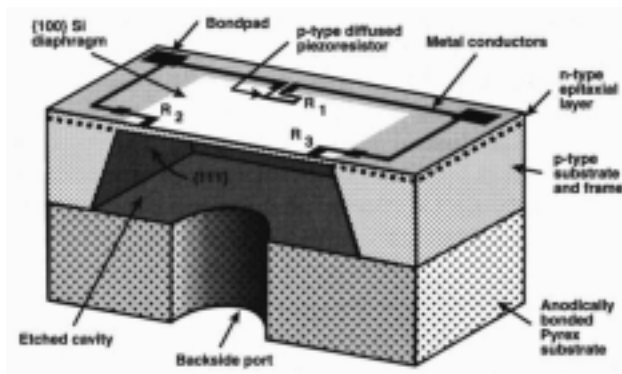
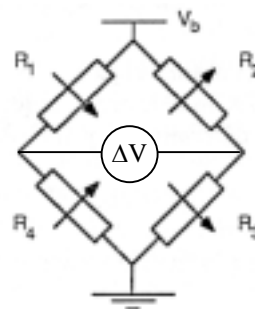
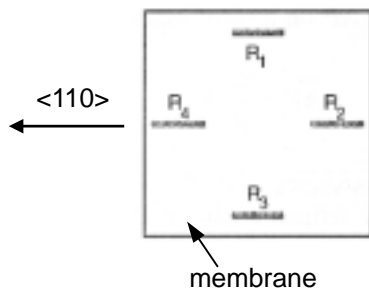


微機電系統導論期末考 (93/1/7)

1. Please give three types of materials used as structure layers in surface micromachining and their corresponding sacrificial layers and releasing methods. (10%)
2. Explain the three basic processes of LIGA. Please also specify the light source and the major materials of the mask, the photo resist, and the electroforming in your description. (10%)
3. Use the knowledge of the processes of surface and bulk micromachining learned in the lectures, to design a process flow for the following Piezoresistive Pressure Sensor. The explanation needs to include the sketch of the cross sections and the details of the materials deposition methods and the micromachining process (Clearly specify the mask pattern, film depositions, doping, machining processes, and bonding processes. You do not need to show the details of lithography steps). (15%)



4. (a) Please explain the working principle of the Piezoresistive Pressure Sensor shown in the above figure.
- (b) Please explain the arrangement of the resistors in the following figure, and how to use the Wheaston's bridge to detect the change of resistance (show the relationship between ΔV and ΔR if $R_1=R_2=R_3=R_4$). (10%)



5. Please explain in details the working principle of the Mach-Zehnder Interferometer shown in the following figure. (10%)

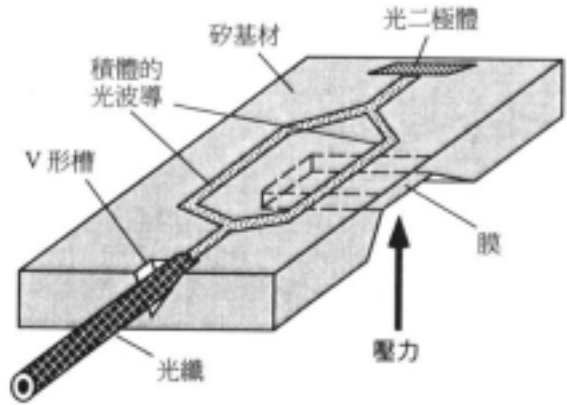
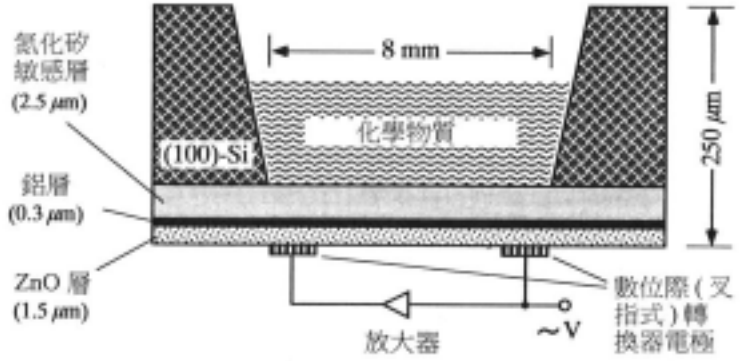


圖 6.8 馬赫切德干涉儀。根據 [Fisch 91]。

6. Explain in details the working principle of the chemical sensor using surface acoustic wave. (10%)

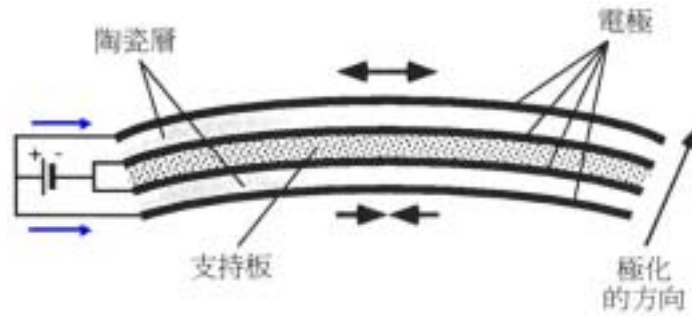


7. What are the two groups of biosensors according to their working principles? Give a short explanation for each group (5%)

8. (a) Explain the motion principle of Electrostatic Microactuators, and how to realize the linear and rotational drives using the electrostatic principle.

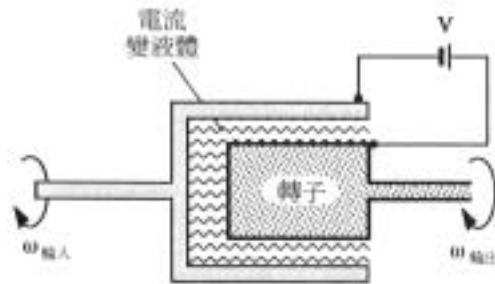
(b) What are the major disadvantages of Electrostatic Microactuators? (10%)

9. Explain the motion principle of the piezoelectric cantilever structures in the following figure. (10%)



10. Explain the motion principle and the property of Shape Memory Actuators. (10%)

11. Explain in details the working principle of the Electrorheological Actuators in the following figure. (5 %)



12. Compare MEMS packages and IC packages. (5%)