

Microelectromechanical Systems for Mechanical Engineering Applications

(마이크로기전시스템의 기계공학 응용)

기출문제 예시

1. (O, X) If true, +2 pts. If false, -2 pts. (22 pts)

- (1) In anisotropic wet etching, Si (100) etch typically results in pyramidal pits with 54.74 ° (111) side wall angles.
- (2) In CVD kinetics, surface reaction limits the kinetics at low temperatures while mass transport limits at high temperatures.
- (3) In order to obtain good lift-off characteristics, sputtering process is highly recommended.
- (4) ...

Tip: O/X 문제는 모르면 찍지 않는 게 좋겠죠?

2. Briefly explain the following term. (3 pts each)

- (5) Bulk micromachining
- (6) LIGA process
- (7) Scaling concept
- (8) ...

Tip: 중요한 용어나 기술에 대해 간략하게 답하는 문제

3. (20 pts)

Laplace pressure is represented by the well-known Young's equation, which is given by

$$\Delta P = \frac{2(\gamma_{SG} - \gamma_{SL})}{r} \quad (1)$$

where γ_{SG} and γ_{SL} are the surface tensions at the solid/gas and solid/liquid interfaces, respectively.

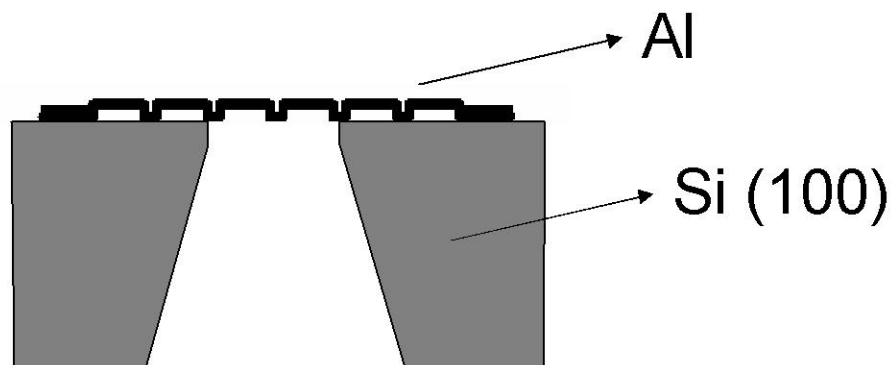
- (1) What are the scaling exponents of dimension (l) of Laplace pressure, surface

tension force and surface tension energy? (Hint: surface tension is assumed to be constant irrespective of size). (10 pts)

- (2) Using the result of (1), predict the change of acceleration (a) and time (t) if the mass (m) is reduced by ten times. (10 pts)

Tip: Scaling concept 에 대한 개념과 간단한 계산 능력 테스트 문제

4. Devise a full step-by-step process to fabricate the following Al diaphragm. What is the minimum number of steps? You need to start with a bare silicon wafer and describe each process in detail for full credits. Make sure that all the processes are in right order. (20 pts)



Tip: 특정한 구조를 주고 멤스 공정의 flow chart 를 구성하는 문제

5. Describe how to make a silicon-on-insulator (SOI, see figure) wafer in two ways. Which one is preferred for good oxide properties? Write down a simple process to fabricate a freestanding structure using a SOI wafer. (16 pts)

