



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(TAKE HOME)
SEMESTER I
SESSION 2020/2021**

COURSE NAME : SEMICONDUCTOR FABRICATION
COURSE CODE : BWC 32602
PROGRAMME CODE : BWC
EXAMINATION DATE : JANUARY/FEBRUARY 2021
DURATION : 5 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS
OPEN BOOK EXAMINATION

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THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

- Q1** (a) The molecular weight and the density of Si are 28.9 g/mol and 2.33 g/cm³, respectively. The corresponding values for molecule weight and density of SiO₂ are 60.08 g/mol and 2.21 g/cm³, respectively. If a silicon oxide layer of thickness x is grown by thermal oxidation, determine the thickness of silicon being consumed. (8 marks)
- (b) Refer **Figure Q1 (b)**.
- (i) Determine the time taken to grow 100 nm of oxide in wet oxygen at 1000 °C (assume <100> silicon). (3 marks)
- (ii) Determine the time taken to grow 100 nm of oxide in dry oxygen at 1000 °C (assume <100> silicon). (2 marks)
- (iii) Which process would be preferred? Justify your answer. (6 marks)
- (c) Briefly explain the factor that influence the thermal oxidation rate. (6 marks)
- Q2** (a) Explain the purposes of etching used in semiconductor fabrication. (5 marks)
- (b) Explain why dry etching is preferred over wet etching in removal of small trenches in semiconductor fabrication. (10 marks)
- (c) Differentiate the mechanism of positive and negative photoresist. (10 marks)
- Q3** (a) Construct a process flowchart outlining for the fabrication of the structure as shown in **Figure Q3(a)**. (10 marks)
- (b) Explain **ONE (1)** method of metal deposition used in the metallization process of semiconductor fabrication. (5 marks)
- (c) Describe the advantages and disadvantages of Metal Oxide Chemical Vapor Deposition (MOCVD) (5 marks)
- (d) Describe the mechanisms for film deposition using chemical vapor deposition. (5 marks)

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- Q4** (a) Using an appropriate diagram, explain the process of reactive ion etching. (10 marks)
- (b) Discuss **ONE (1)** problem that can occur in the implantation stage that can lead to fabrication errors or affect the device performance. (5 marks)
- (c) Describe **TWO (2)** stopping mechanisms by which an energetic ion, on entering a semiconductor substrate (also called the target), so it can be brought to rest. (6 marks)
- (d) Explain how to minimize the ion channeling. (4 marks)

– END OF QUESTIONS –

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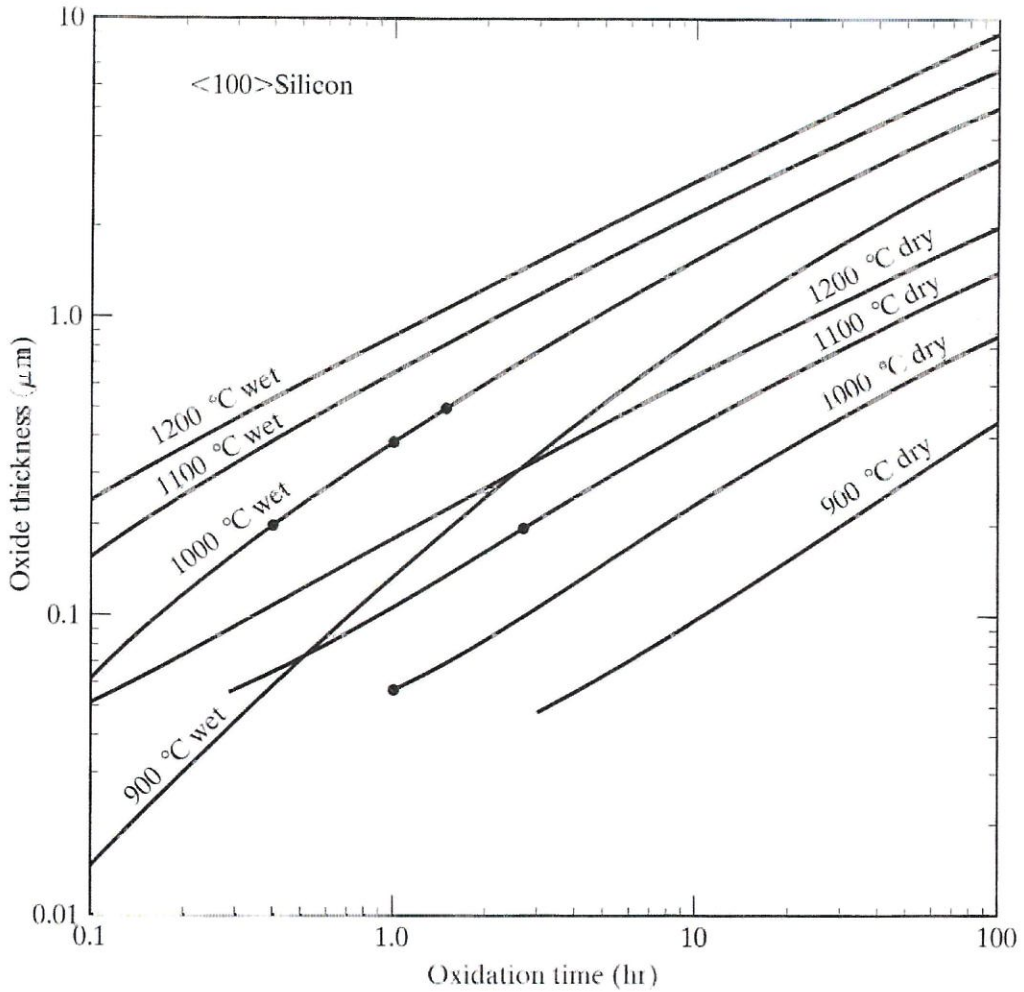


FIGURE Q1(b)

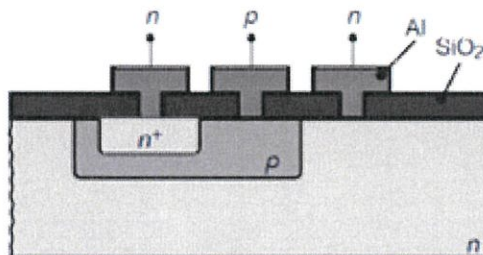


FIGURE Q3(a)

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