

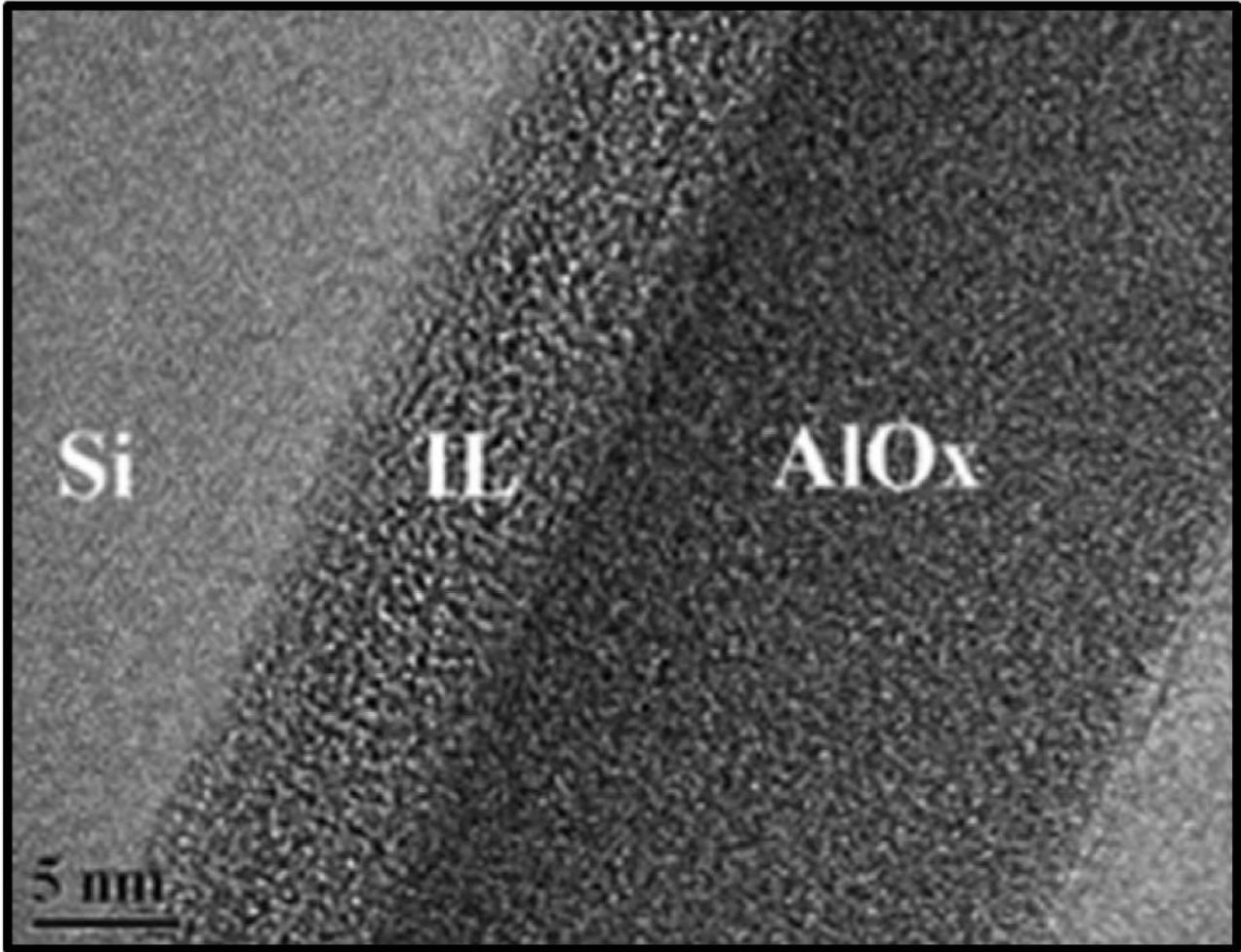
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|--------------|-----------------------------------|
| Started on | Monday, 9 September 2024, 2:43 PM |
| State | Finished |
| Completed on | Monday, 9 September 2024, 2:43 PM |
| Time taken | 36 secs |
| Marks | 5.00/5.00 |
| Grade | 10.00 out of 10.00 (100%) |

Question 1

Correct

Mark 1.00 out of 1.00

The picture below shows the cross-section TEM image of a silicon wafer on which aluminum oxide is deposited by reactive sputtering in a gas mixture of oxygen and argon. The interfacial layer was determined as aluminum silicate. Which of the following impacts of the plasma are responsible for the production of aluminum silicate?



- ☒ a. Intermixing of the deposited film with the substrate by energetic particles. ✓
- ☒ b. Oxidation of silicon by the oxygen ions and free radicals. ✓
- ☐ c. Sputtering of silicon from the wafer surface.

Your answer is correct.

The correct answers are: Intermixing of the deposited film with the substrate by energetic particles. , Oxidation of silicon by the oxygen ions and free radicals.

Question 2

Correct

Mark 1.00 out of 1.00

A student was tasked with the development of a SiO₂ film to have a 100 nm film on silicon wafers. The student has to choose between thermal oxidation of the silicon in a furnace, and reactive sputtering using a silicon wafer as the source of silicon (using O₂ + Ar mixture). The student wrote down the following points as part of the exercise. Which of these points are correct?

- ☐ a. The sputtered oxide will have a lower leakage current.
- ☒ b. The thermal oxide will have a higher breakdown voltage. ✓
- ☒ c. The interface state density is likely to be lower in the thermal oxidation process. ✓

Your answer is correct.

The correct answers are: The thermal oxide will have a higher breakdown voltage. , The interface state density is likely to be lower in the thermal oxidation process.

Question 3

Correct

Mark 1.00 out of 1.00

In atmospheric CVD process, the susceptor (the carrier on which the wafers are placed) is held in a tilted position. What is the purpose of tilting the susceptor?

- ☐ a. To maintain a uniform temperature in the reactor.
- ☐ b. So that more wafers can be loaded in the reactor in a batch.
- ☒ c. To maintain the thickness of the boundary layer constant along the length of the reactor. ✓

Your answer is correct.

The correct answer is: To maintain the thickness of the boundary layer constant along the length of the reactor.

Question 4

Correct

Mark 1.00 out of 1.00

In which flow regime are the thermal CVD reactors used for thin film deposition for VLSI applications operated?

- ☒ a. laminar flow regime. ✓
- ☐ b. turbulent flow regime.
- ☐ c. transition flow regime.

Your answer is correct.

The correct answer is: laminar flow regime.

Question 5

Correct

Mark 1.00 out
of 1.00

Starting with SiH_4 , which of the following sequence of reactions will not result in the deposition of a film of silicon on a silicon substrate?

(g) - means, in gas phase

(a) - adsorbed on the surface of the wafer

(s) - solid film formed on the surface of the wafer

☒ a. $\text{SiH}_4(\text{g}) \rightleftharpoons \text{Si}(\text{g}) + 2\text{H}_2(\text{g})$ ✓

$\text{Si}(\text{g}) \rightarrow \text{Si}(\text{s})$

☐ b. $\text{Si}_2\text{H}_6(\text{g}) \rightleftharpoons \text{Si}_2\text{H}_6(\text{a})$

$\text{Si}_2\text{H}_6(\text{a}) \rightarrow 2\text{Si}(\text{s}) + 3\text{H}_2(\text{a})$

☐ c. $\text{SiH}_2(\text{g}) \rightleftharpoons \text{SiH}_2(\text{a})$

$\text{SiH}_2(\text{a}) \rightarrow \text{Si}(\text{s}) + 2\text{H}_2(\text{a})$

☐ d. $\text{SiH}_4(\text{g}) \rightleftharpoons \text{SiH}_4(\text{a})$

$\text{SiH}_4(\text{a}) \rightarrow \text{Si}(\text{s}) + 2\text{H}_2(\text{a})$

Your answer is correct.

The correct answer is: $\text{SiH}_4(\text{g}) \rightleftharpoons \text{Si}(\text{g}) + 2\text{H}_2(\text{g})$

$\text{Si}(\text{g}) \rightarrow \text{Si}(\text{s})$

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