

Started on	Monday, 2 September 2024, 1:54 PM
State	Finished
Completed on	Monday, 2 September 2024, 1:54 PM
Time taken	44 secs
Marks	8.00/8.00
Grade	10.00 out of 10.00 (100%)

Question 1

Correct
Mark 2.00 out of 2.00

Match the metal to the correct statement on the evaporation temperature. Ref.
John E. Mahan, "Physical Vapor Deposition of Thin Films", John Wiley and Sons, 2000

Cromium	evaporation temperature < melting point	✓
Fe	evaporation temperature ~ melting point	✓
Al	evaporation temperature > melting point	✓

Your answer is correct.
The correct answer is: Cromium → evaporation temperature < melting point, Fe → evaporation temperature ~ melting point, Al → evaporation temperature > melting point

Question 2

Correct
Mark 2.00 out of 2.00

A thin film of silicon was deposited on a silicon surface using SiH4 as precursor using chemical vapor deposition. Match the crystalline phase of the film to the process conditions given.

CVD at 700°C	Poly crystalline	✓
CVD at 1100°C	Mono crystalline	✓
CVD at 200°C	amorphous silicon	✓

Your answer is correct.
The correct answer is: CVD at 700°C → Poly crystalline, CVD at 1100°C → Mono crystalline, CVD at 200°C → amorphous silicon

Question 3

Correct

Mark 1.00 out of 1.00

Periodic table explorer is a very useful application developed by Paul Alen Freshney. The app provides information and properties of the elements in the periodic table. The resistivity of metals is one of the properties listed. The resistivity of metals listed in such resources are based on measurements conducted on high purity, dense samples of the metals. The resistivity of aluminum found in the periodic explorer is $2.65 \times 10^{-6} \Omega \cdot \text{cm}$. A student deposited aluminum by thermal evaporation and found the resistivity to be $3 \times 10^{-6} \Omega \cdot \text{cm}$, assuming the measurement to be correct, which of the following could be the reason(s) for the higher resistivity measured by the student? The film deposited by the student is referred to as "the film" below.

- ☒ a. The film contains high density of pin holes. ✓
- ☒ b. The film is porous. ✓
- ☒ c. The film contains contaminants from the crucible. ✓
- ☒ d. The vacuum chamber contained trace amounts of oxygen. ✓
- ☒ e. The average polycrystalline grain size in the film is much smaller than the one reported in the reference. ✓

Your answer is correct.

The correct answers are: The film is porous. , The average polycrystalline grain size in the film is much smaller than the one reported in the reference. , The film contains contaminants from the crucible. , The vacuum chamber contained trace amounts of oxygen. , The film contains high density of pin holes.

Question 4

Correct

Mark 1.00 out of 1.00

Which of the following deposition technique can provide thin films with 100% step coverage?

- ☐ a. Sputter deposition.
- ☐ b. Chemical vapor deposition.
- ☐ c. Plasma enhanced chemical vapor deposition.
- ☐ d. Evaporation.
- ☒ e. Atomic layer deposition. ✓

Your answer is correct.

The correct answer is: Atomic layer deposition.

Question 5

Correct

Mark 1.00 out of 1.00

For the evaporation of Iridium in a thermal evaporation system, which of the following elements are suitable for the construction of the crucible?

Ref.: John E. Mahan, "Physical Vapor Deposition of Thin Films", John Wiley and Sons, 2000

- ☐ a. Carbon
- ☐ b. Platinum
- ☒ c. Tungsten ✓

Your answer is correct.

The correct answer is: Tungsten

Question 6

Correct

Mark 1.00 out of 1.00

In which of the following cases, the nucleation delay in thin film growth can be ignored?

- ☒ a. In the determination of deposition rate based on the growth of a 400 nm thick film. ✓
- ☐ b. In the determination of deposition rate based on the growth of a 4 nm thick film.
- ☐ c. It can be ignored for all thicknesses.

Your answer is correct.

The correct answer is: In the determination of deposition rate based on the growth of a 400 nm thick film.

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