Practice quiz examples of etching processes for Si-based materials

Questions:

0 points possible (ungraded)

1. When in the Bosch process the pressure of the etching gas is chosen too high, it happens that initially vertical etched structures get a more and more tapered and less steep profile when etching deeper in the substrate. What is the main reason behind this?

- The increase of pressure in the etching gas causes a decrease of pressure in the polymerization gas and therefore polymerization gas accumulates in the bottom
- **The mean free path in the gas is low, which can give rise to reduced gas access and removal of reaction products from the bottom of the structure** ✔
- The overpressured etching gas turns into deposition mode and it starts stacking on the bottom of the structures
- The etching gas is overexcited, which causes the amount of atoms per volume to decrease gradually

Explanation

When the etching gas pressure is too high, the mean free path in the gas is low, which can give rise to reduced gas access and removal of reaction products from the bottom of the structures. Therefore, there will be less vertical side walls towards the bottom of the etched structures. See "Examples of etching processes for Si-based materials" video from 11:25 to 12:05 for more detailed explanations.

2. Which of the following is true for a cryogenic deep dry Si etching process?

- The chuck temperature does not have a significant influence on the etching profile
- The etching rate and the selectivity are low
- **Addition of too much oxygen can cause grass generation** ✔
- The loading effect is eliminated for this process

Explanation

In cryogenic deep dry Si etching process, first the silicon wafer is brought to -110 °C. Hereafter, SF_6 gas is used for etching and O_2 gas is used for passivation. Both of these operations are performed simultaneously. See "Examples of etching processes for Si-based materials" video from 17:35 to 18:45 for more detailed explanations.

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Answers are displayed within the problem