Practice quiz deep dry etching of silicon; dry etching without a plasma

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Questions:

0 points possible (ungraded)

1. Which of the following is true related to the pulsed deep dry etching process of Si (Bosch process)?

- SF_6 is used in the sequence as the passivation gas
- A loading effect is observed when there is a wide mask opening and a narrow mask opening on the same wafer
- The etching rate can be increased by adding Ar in between etching and passivation steps
- C_4F_8 is used in the sequence as the chemical etching gas

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Explanation

In deep dry etching of Si (Bosch process), SF_6 gas is used for etching and C_4F_8 gas is used for polymerization. These gases are activated in the chamber alternatively to reach a desired etching depth with vertical side walls. Depending on the area opening of the mask, etching rates might be area-dependent. The etching gas has easier access into a large hole than a small hole and the reaction products can also be better removed. This phenomenon is known as “loading effect”. Ar gas does not play any role in the etching process. See "Deep dry etching of silicon; dry etching without a plasma" video from 2:00 to 6:00 for more detailed explanations.

2. Which of the following is true for a dry etching equipment?

- An electrostatic chuck is used to stabilize the electron density in the chamber
- A load chamber is utilized to load the desired gas for the etching process
- Optical end point detection is used to monitor the stability of the fixation of the wafer on the electrostatic chuck
- A scrubber gas treatment is necessary to avoid toxic side products to be released in the environment

Explanation

In a typical example of a dry etching equipment, the load chamber is used as a wafer holder and this wafer is translated into the reactor without breaking the vacuum in the chamber. An electrostatic chuck is utilized to clamp the wafer in the chamber. A scrubber gas treatment is used to eliminate toxic side products. Optical End Point Detection (EDP) is utilized to provide information on the materials that are etched away. See "Deep dry etching of silicon; dry etching without a plasma" video from 9:35 to 11:45 for more detailed explanations.

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