Practice quiz dry etching in a gas plasma; etching anisotropy

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Questions:

0 points possible (ungraded)

1. Which of the following must be performed to convert an isotropic CF_4 etching process to a purely anisotropic etching process?

- Increasing the chamber pressure
- Increasing the bias voltage
- Adding 10% H_2 to decrease the F/C ratio
- Adding O_2 to increase the F/C ratio

Explanation

The horizontal and vertical etching rates are reduced by the removal of F radicals with H atoms. At 10% H_2 addition, horizontal etching is completely eliminated. The polymerization rate in a way compensates for the etching in horizontal direction. See "Dry etching in a gas plasma; etching anisotropy" video from 11:20 to 13:15 for detailed explanations.

2. In a CF_4 plasma to which hydrogen gas is added due to which the side walls of an etched hole can be protected from etching by deposition of a fluorocarbon polymeric layer, how can the selectivity of dry etching be increased?

- By increasing the temperature
- By decreasing the H_2 concentration
- By increasing the monomer concentration
- By decreasing the pressure

Explanation

A dry etching process can be selective, which means that it will only etch the target, not the mask material. Selectivity can be enhanced by tuning the polymerization point of the gas. More polymerization will lead to extra masking material that gets deposited so that the mask can withstand the etching longer. Increasing the monomer concentration, increasing H_2 concentration, decreasing the temperature and increasing the pressure are some of the valid methods to increase the selectivity. See "Dry etching in a gas plasma; etching anisotropy" video from 13:20 to 14:15 for more detailed explanations.

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