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Silicon nitride cleaning by F_2/Ar remote plasma processing

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Remote plasma cleaning process was investigated using F_2/Ar for silicon nitride plasma enhanced chemical vapor deposition (PECVD) chamber cleaning and perfluorocompounds (PFCs) emission properties during were investigated. Cleaning in this experiment, due to difficulty of handling F_2 gas, various safety measures for storage and delivery were made. Chamber cleaning experiments of silicon nitride layers were carried out by varying the total gas flow ratio, $F_2/(F_2+Ar)$ flow ratio, working pressure and cleaning temperature. Species emitted during cleaning were monitored by (FT-IR) and residual gas analyzer (RGA). Under the current experimental condition, the trend for the cleaning rate of silicon nitride layers in both total F_2 flow rate and $F_2/(F_2+Ar)$ gas flow ratio effects was almost the same. Increasing the cleaning temperature also enhanced the cleaning rate by a factor of 3.5, 4.2, and 3.1 at the cleaning temperature of 150, 250, and 350℃ as compared to that without substrate heating, respectively.