VI-K Thin Film Preparation with Chemical Vapor Deposition Using Vacuum Ultraviolet Radiation

Thin-film deposition at temperatures as low as possible and without damages is one of the key technologies for fabrication of ultra-large scale integrated circuit (ULSI). Photon-assisted chemical vapor deposition is a promising way to prepare particularly dielectric thin-films. Silicon dioxide films have been prepared from tetraethoxyorthosilicate ($Si\text{-}(OC_2H_5)_4$) with chemical vapor deposition using vacuum ultraviolet radiation. The growth rate increases with decreasing the substrate temperature.

VI-K-1 Silica Film Preparation by Chemical Vapor Deposition Using Vacuum Ultraviolet Excimer Lamps

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New scheme for silica film fabrication by a photo-chemical vapor deposition was developed by using excimer lamps in vacuum ultraviolet to ultraviolet spectral region. Smooth and uniform silica films were deposited at room temperature at a deposition rate of 1 nm/min.

VI-K-2 Silica Film Preparation by Chemical Vapor Deposition Using Vacuum Ultraviolet Excimer Lamps

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We have prepared SiO_2 thin films on silicon wafers from tetraethoxyorthosilicate (TEOS; $Si(OC_2H_5)_4$) by photo-chemical vapor deposition with the use of various excimer lamps which emit incoherent light at 302 (XeCl), 222 (KrCl), 172 (Xe_2), 146 (Kr_2) and 126 nm (Ar_2). The film deposition is observed at wavelengths shorter than 172 nm. With 10-mW/cm^2 172-nm radiation, the growth rate is 8 nm/min on the room temperature substrate. The deposition efficiency depends on the wavelength and shows the maximum value for 146-nm radiation. Addition of O_2 to TEOS induces inhibition of C and H impurity inclusion in the films.