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N_2와 SiH_4 가스를 사용하여 PECVD로 증착된 Silicon Nitride의 FT-IR spectra 분석과 전기적 특성 분석

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Plasma enhanced chemical vapor deposited (PECVD) silicon nitride (SiNx) is dominate gate dielectric material for the amorphous silicon(a-Si:H) thin film transistors (TFTs) today[1]. SiNx films were deposited at low temperature (375℃) by means of PECVD. The reaction gases used were pure nitrogen and a helium dilution of silane gas. Experiment conditions were different N^2/SiH_4 flow ratios from 3 to 50 and the rf powers of 200 W. SiNx can be characterized according to its chemical properties, such as Si/N ratio, Si-H and N-H concentrations. They all affect the transistor's threshold voltage, reliability, on-current and off-current[1]. Electrical properties were analyzed through high frequency (1MHz) C-V and current-voltage (I-V) measurements. The thickness and the refractive index od the films were measured by ellipsometry and Chemical bonds were determined by using an FT-IR equipment[2]. SiNx films exhibited a low leakage current density of 2.06×10^{-7} A/cm^{-2} at a reverse electric filed of 40 kV/cm. Strong H-atom release from the growing SiNx film and Si-N bond healing are responsible for the improved electrical and passivation properties of SiNx film. High hydrogen content at the range of about 1.76×10^{22} cm^{-3} was achieved as N-H groups in the SiNx films. The refractive index of SiNx films indicate between 1.72 and 2.05 This article presents the SiNx gate dielectric studies in terms of deposition rate, hydrogen content, and leakage current characteristics for the gate dielectric layer of thin film transistor applications.

[참고문헌]

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