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S1-P6

Structural, optical, and mechanical properties of silicon nitride films deposited by inductively coupled plasma enhanced chemical vapor deposition

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Silicon nitride (SiN_x) is a widely used dielectric material due to its superior optical properties and compatibility with processing techniques of semiconductor and microelectronics devices. Other than its potential applications, this material is regarded as a hard-mask material for patterning of such devices [1, 2] and as an alternative to traditional doped silica waveguide technology in indium phosphide-based photonic integrated circuits (InP PICs) [3]. In the context of the required SiN_x film thicknesses, which are generally greater than 1 µm for dry etching, the mechanical stress within these films can make processing steps such as photolithography extremely challenging along with affecting the integrity and performance of the PICs.

In this study, a low-temperature and low-pressure SiN_x film deposition on InP substrates is investigated using inductively coupled plasma enhanced chemical vapor deposition (ICPECVD) technology. Figure 1(a) shows the deposition rates of the SiN_x films deposited at different temperatures as a function of deposition time whereas Figure 1(b) demonstrates the dependency of the refractive index (n) on deposition temperature as a function of wavelength. We discuss herein the results of an extensive characterization of structural and mechanical properties of the ICPECVD-SiN_x films along with the results given in Figure 1.

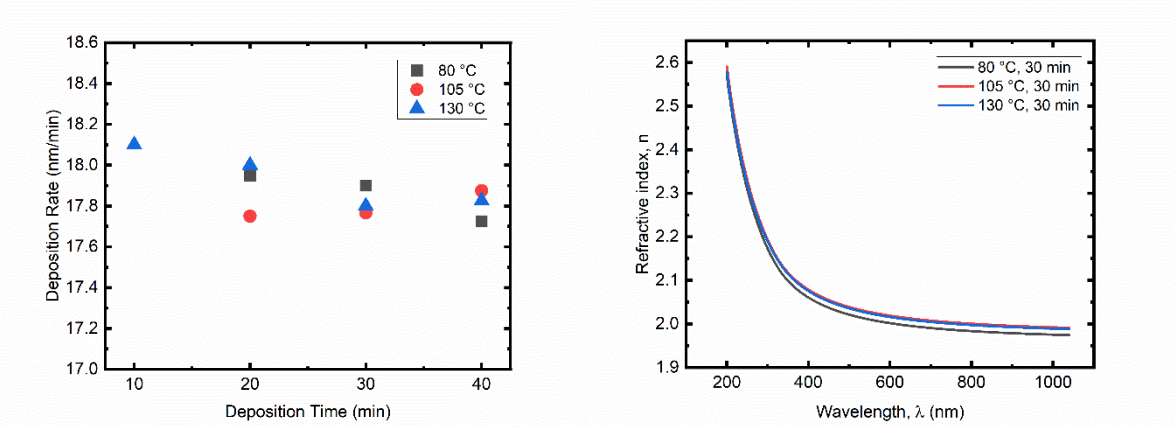

Fig. 1 Dependencies of deposition rate (a) and refractive index (b) of SiN_x films on deposition temperature.

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