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Optical Properties of SiNx Films by Catalytic CVD at Low Temperature (<200℃)

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As there is a wide range of evolutions to the ubiquitous computing circumstance, device integration on to nonconventional substrates is required. In order to develop devices on plastic substrates, we need to study how to manufacture semiconductor and insulator films at a "low temperature".

In this work, we have deposited Si rich silicon nitride films using catalytic chemical vapor deposition (Cat-CVD) at a low temperature (<200℃) for photonic devices. Source gases were NH_3, SiH_4, and control parameters were filament temperature (1650℃ ~ 1850℃), process pressure (100 mTorr ~ 200 mTorr), gas mixture ratio ($[NH_3]/[SiH_4]$ = 49/1 ~ 48/2). Defect states and the band gap were measured by photoluminescence spectroscopy (PL), and x-ray photoelectron spectroscopy (XPS). In addition, to fabricate Si nano-clusters in the Si rich silicon nitride films, additional experiments were performed by observing the change of photoluminescence with introduction of H_2 gas.