

# In-Depth Study of Silicon-Oxide Thin Films: Effect of N<sub>2</sub>O/SiH<sub>4</sub> gas mixture

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**Abstract.** Silicon-oxide based films in photonics are key for optoelectronic applications due to their wide tunable optical and physical properties based on the growth conditions. In this paper, low temperature processed silicon-oxide thin films have been fabricated by a radio frequency (13.56 MHz) capacitively-coupled PECVD method at 250 °C using variable ratio of SiH<sub>4</sub> and N<sub>2</sub>O as gas precursors. Films having excellent surface morphology with a nominal thickness of 600 nm were grown on different substrates. The effect of the gas flow ratio  $R = \text{N}_2\text{O}/\text{SiH}_4$  on the composition, morphology, microstructure, chemical bonding configuration and optical properties of these films has been investigated, and the experimental results are presented and discussed. Variable elemental composition Si/O, high deposition rate (up to 60 nm/min), refractive index of 1.47 - 3.80 and band gap values of 1.91 - 9.00 eV of silicon-oxide films have been obtained by variation of the  $R$  value.