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Optical properties of oxygen doped diamond-like carbon thin films

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Abstract

In this work, oxygen doped diamond-like carbon thin films were deposited on silicon substrates by a RF-PECVD method using mixture of methane (CH_4), argon (Ar) and oxygen (O_2) precursor gases. The refractive index (n), extinction coefficient (k) and thickness of the thin films were measured by spectroscopic ellipsometery method (SE). The absorption coefficient (α) and optical band gap were also derived. The structure of the films was investigated by Raman spectroscopy. Fourier Transform Infra-Red (FTIR) spectroscopy was used to measure the transmittance in the midwave infrared (mid IR) region and to identify existing bonds in the structure of the films. The results showed that these films were ideal to use them as antireflective coatings for silicon optics in mid IR. Oxygen doping did not significantly change optical properties; and did not have undesirable effect on the antireflection property. Among the films, the oxygen doped diamond-like carbon film that was deposited with 5.6 % volume oxygen had highest refractive index, lowest optical gap and minimum film deposition rate.

Keywords: RF-PECVD; Diamond like carbon; Oxygen; Optical properties.

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