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ABSTRACT

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Radio Frequency Chemical Vapor Deposition (RFCVD) system with planar parallel electrodes of disc shape was set up for preparing diamond-like carbon (DLC). The DLC films were deposited on slide glass substrates ($25 \times 75 \text{ mm}^2$) which placed on the ground electrode. The effects of the CH_4 flow rate, the discharge power of gas and that of Ar etching of substrates and the flow rate of CH_4/He and CH_4/Ar were studied. The results from Raman spectroscopy and UV-visible spectroscopy showed that the as deposited films were a-C:H of which the optical band gaps were higher than 0.8 eV as the flow rate of CH_4 was increased ($\geq 1.0 \text{ sccm}$) at the operating power of 100 W. The effect of Ar etching increased the film's growth rate. It was found that changing the flow rate of CH_4/He yielded the best a-C:H films with the optical band gap of between 0.8 – 1.5 eV. The optical band gap of films prepared from CH_4/Ar was higher than 1.8 eV yielding the polymer like properties. The film's thickness were measured by using the low angle X-ray diffraction technique. The results showed that the obtained films were homogeneous. The analysis by ellipsometry yielded the film's thickness contour on the surface of the film. The electron density distribution using Langmuir probe insisted that the 0.2 flow rate of CH_4/He yielded the most homogeneous DLC's film with the standard deviation of 6 nm.