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Deposition of Si-DLC coatings at moderate temperatures by bipolar pulsed dc PACVD

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A common technique to produce silicon doped diamond-like carbon coatings (Si-DLC also referred as a-C:H:Si) is plasma-assisted chemical vapour deposition (PACVD) by utilizing radio-frequency (RF) discharges. Recently, it was demonstrated that high quality Si-DLC can be also deposited in pulsed direct-current (dc) discharges in spite of the insulating nature of such a coating. In order to reduce the probability of arcing often bipolar pulsed dc discharges are used instead of unipolar discharges. Usually, the deposition takes place at temperatures well above 400 °C.
In the present study a systematic investigation of Si-DLC deposition using bipolar pulsed dc PACVD was performed in the temperature region between 280 and 340 °C. The process gas consisted of argon, hydrogen, methane and HMDSO. Growth rates were determined at different discharge parameters, e.g. process gas composition, pressure, plasma power, duty cycle, ratio of positive to negative pulses and substrate temperature. The coatings were analysed by GDOS for chemical composition. The microhardness of the Si-DLC coatings measured with a Fischerscope tester reached under certain conditions values above HV 2000. Scratch tests revealed critical loads in the order of 15 N on hard chromium coated steel substrates. Detailed results will be presented.

Keywords
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