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PII: S0040-6090(17)30912-4
DOI: https://doi.org/10.1016/j.tsf.2017.12.016
Reference: TSF 36390

To appear in: *Thin Solid Films*

Received date: 29 August 2017
Revised date: 29 October 2017
Accepted date: 19 December 2017

Please cite this article as: Wei Dai, Se-Hun Kwon, Qimin Wang, Jingmao Liu , Influence of frequency and C2H2 flow on growth properties of diamond-like carbon coatings with AlCrSi co-doping deposited using a reactive high power impulse magnetron sputtering. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), https://doi.org/10.1016/j.tsf.2017.12.016

# Influence of frequency and $C_2H_2$ flow on growth properties of diamond-like carbon coatings with AlCrSi co-doping deposited using a reactive high power impulse magnetron sputtering

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**Abstract:** In this paper, diamond-like carbon (DLC) coatings with AlCrSi co-doping were deposited by a reactive high power impulse magnetron sputtering (HiPIMS) with utilizing a gas mixture of Ar and $C_2H_2$ as the precursor. The doping contents of Al, Cr and Si in the coatings were controlled by adjusting the $C_2H_2$ flow fraction in the gas mixture. The influences of the HiPIMS frequency and $C_2H_2$ flow on the microstructure, composition, mechanical properties and tribological behaviors of the AlCrSi-DLC coatings were researched carefully by using scanning electron microscope, X-ray photoelectron spectroscopy, nano-indentation and ball-on-plate tribometer, respectively. The results show that the doping AlCrSi contents increased as the $C_2H_2$ flow fraction decreased, along with the obvious structural transformation of the coatings from amorphous feature to carbide composites. The high $C_2H_2$