3P07

デュアルハイパワーインパルスマグネトロンスパッタリングによるDLC成膜

BASIC CHARACTERISTICS OF DUAL HIPIMS AND ITS APPLICATION TO MATERIAL PROCESS

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1. Introduction

High power impulse magnetron sputtering (HiPIMS) has been developed as a new technology is promising method to prepare hard diamond-like carbon (DLC) films [1]. The short – pulse HiPIMS is effective to increase the ionization rate because the high-voltage can be applied to the target without arcing [2]. However, this method is limited by its low deposition rate. In this paper, improvement of deposition rate of DLC film using two power supplies with different applied voltage and pulse widths was investigated.

2. Experimental setup

A cylindrical vacuum chamber was evacuated to 5×10^{-3} Pa and the argon gas was fed into the chamber with the gas pressure of 1.6 Pa. The carbon target of 150 mm in diameter was set on water-cooled copper plate. High voltage short pulse power supply (spiker power supply) with the voltage up to -1800 V and the pulse width of 7 μs and low voltage long pulse power supply (sustainer power supply) with the voltage up to -800 V and the pulse width of 400 μ were independently applied to the target.

3. Results

Fig. 1 shows the input energy into the target and deposition rate as a function of spiker voltage when the sustainer voltage was -700 V. The deposition rate was independent to the spiker voltage. Fig. 2 shows the input energy and deposition rate as a function of sustainer voltage when the sustainer voltage was -1800 V. In the case of 0V and -700V of the applied sustainer voltage, the deposition rate are 13.6 nm/min and 222.9 nm/min, respectively. The deposition rate is 16 times higher than that without sustainer voltage.

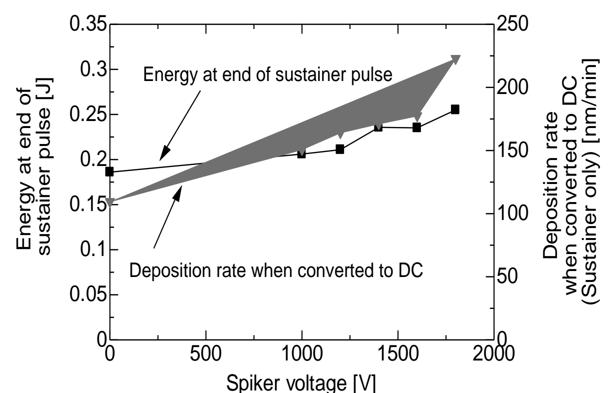

Fig. 1 the enegy and deposition rate as a function of spiker voltage when the sustainer voltage was -700 V.

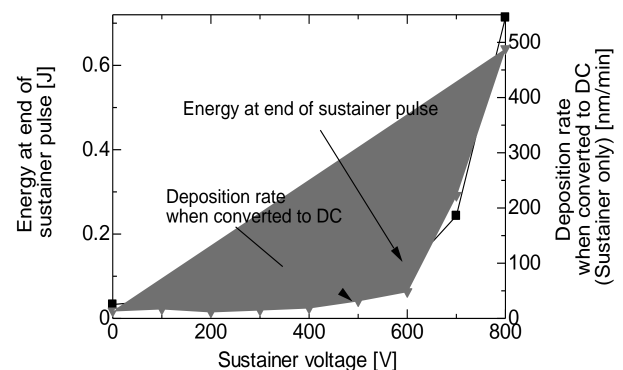

Fig. 2 The enegy and deposition rate as a function of sustainer voltage when the sustainer voltage was -1800 V.

References

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