

Application of pre-ionization technique onto a magnetized coaxial plasma gun

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Physical-Vapor-Deposition (PVD) technique by means of electromagnetic acceleration utilizing magnetized coaxial plasma gun (MCPG) has been developed for application to carbon-based thin film such as Diamond-Like-Carbon (DLC) [1][2]. This MCPG- PVD method has superiority such as low heat load, absence of hydrocarbon gas, etc., over conventional methods.

In this study, the pre-ionization technique has been applied onto the MCPG-PVD system to reduce macro-particle and to mitigate the energy decay of plasmoid by the retained neutral gas in the film formation chamber.

In this work, we have employed two pre-ionization techniques using DBD (dielectric barrier discharge) on gas feed tube and pulse spark discharge by a rod electrode method. Characteristics of generated plasma and carbon thin-film with those pre-ionization techniques have been evaluated [3].

* This work is partially supported with an unrestricted grant from Amano Institute of Technology.

[1] T. Asai et al., Japan patent JP4769014B, 2011.

[2] T. Asai et al., College of Science and Technology, Nihon University, Academic Lecture proceedings, S1-4 (2015).

[3] T. Nozaki et al., J. Plasma Fusion Res. Vol.83, No.12 (2007)942-956.