Vacuum Arc Deposition of Homogeneous Amorphous Carbon Films at High Growth Rates

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This study focuses on the preparation of amorphous carbon films by vacuum arc deposition to achieve both high growth rates and higher homogeneity of amorphous carbon films by decreasing the number of droplets. The deposition of amorphous carbon films having a low density of droplets at high growth rates was attempted by optimizing discharge voltage, electric charge and the structure of the arc discharge unit. The optimized conditions, such as high discharge voltages, large electric charges and short distances between the cathode spot and the anode edge, decreased the number density of droplets per film thickness. Amorphous carbon films deposited under the optimized conditions had a number density of droplets of 4.2 /mm²/nm at a growth rate of 3.5 nm/count. XPS analysis showed that the deposited amorphous carbon films had an sp³ ratio of about 80%; therefore, the density of the amorphous carbon film was estimated to be approximately 3.0 g/cm³.

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