
Characterization of Plasma Density and Ion Energy in Ribbon-like Cathodic Arc Plasma Magnetic Filter

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Abstract

The filtered cathodic vacuum arc (FCVA) technique has been studied extensively since it became an effective method of producing high quality, dense coating films. In the process of depositing films by FCVA, a particle filter is used to separate and remove macroparticles from the cathodic arc plasma. Among the various filter designs, the most popular is the classic 90° cylindrical bend filter, but the ribbon-like cathodic arc plasma magnetic filter as a more efficient and innovative design has been investigated few. So the study on the plasma density and ions energy in rectangle bend filter can help to find out the plasma flow characterization which would improve the depositing efficiency of films. The experiment was conducted by FCVA system using carbon target, focused on the distribution and characterization of plasma density and ion energy in rectangle bend filter which will be investigated using Langmuir probes and Faraday cup. The Langmuir probe and Faraday cup were placed inside the rectangle bend filter at Plane 0°, Plane 30°, Plane 60° and Plane 90°(Fig.1a). Every plane space was divided into 12 parts to be measured (Fig.1b). Some other parameters, such as focus coil current, guiding coil current,negative bias and inert gas flux, were set at some certain values. At a plane space, the results showed the distinctions of plasma density and ion energy which could help to find out which part is the best position with higher transport efficiency; at different plane space, the results indicated the trend of plasma density and ion energy. It would be explained by Magnetohydrodynamics (MHD) theory to proclaim the law of the plasma transportation in rectangle bend filter by FCVA.

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