

13.56 MHz Hollow Cathode Plasma Source

HCD-L 300 & HCD-P 100

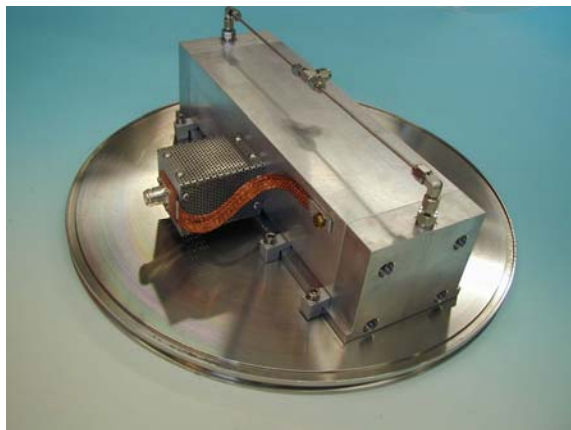


Fig. 1: HCD-L 300

Characterizing the remote plasma polymerization of octafluorocyclobutane induced by RF-driven hollow-cathode discharge

January 1998

The work described below was performed using PlasmaConsult HCD-L 300 and HCD-P 100 hollow cathode plasma sources.

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Characterizing the remote plasma polymerization of octafluorocyclobutane induced by RF-driven hollow-cathode discharge

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Abstract

Thin films with hydrophobic character are required for many applications, e.g., as diffusion barrier or as corrosion protection. These properties can be realized by plasma polymerization of fluorocarbon monomers such as C₄F₈

to produce homogeneous layers of PTFE-like structure. Plasma polymerization requires plasma sources with high deposition rates even when processing thermally unstable substrates or those that absorb RF power. Furthermore, excellent film homogeneity is often needed when coating large surface areas. Here we characterize a radio frequency (RF) remote process to deposit such films where discharge and processing zone are separated. As primary discharge we use a novel, linear, hollow-cathode RF plasma source. The feasibility for homogeneous large-area deposition has already been demonstrated for organosilicon compounds (HMDSO). In this paper the remote polymerization of C₄F₈ is characterized. Geometric effects are discussed as well as the influence of excitation power and gas flows on the process. Deposition rates of 160 nm min⁻¹ and homogeneity of ±2% over a linear dimension of 250 mm are realized. Contact angles of up to 120° correspond to those on conventional poly(tetrafluoroethylene) (PTFE). The refractive index of the films was determined to 1.375±0.025. Fourier transform infra-red spectra proved the existence of PTFE-like structures.

Surface and Coatings Technology

Volume 98, Issues 1-3, January 1998, Pages 1142-1147

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Fig. 2: HCD-P 100

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