Recording Spatially Resolved Plasma Parameters in Microwave-driven Plasmas*

Gerhard FRANZ, Florian SCHAMBERGER, Igor KRSTEV, Stefan UMRATH

Munich University of Applied Sciences Munich D-80335, Bavaria, Germany

Abstract In an almost cubical reactor 90 L in volume which is intended to deposit organic polymers by plasma-enhanced chemical vapor deposition (PECVD), microwave power is coupled into the volume via a quartz window which extends to approximately 1/10 of the sidewall area. Since the plasma is excited locally, plasma parameters like electron temperature and plasma density are expected to exhibit a spatial variation. The compilation of these plasma quantities has been accomplished with a bendable single Langmuir probe. To isolate the tungsten wire against its grounded housing tube, it was coated with polyparylene. After having compared this construction with our Langmuir probe, which has been now in use for more than a decade, we have taken data of more than half the volume of the reactor with argon and have found a definitive radial inhomogenity for all plasma parameters. To investigate whether this conduct can be determined applying optical emission spectroscopy, we improved our spectrometer which had been used for endpoint detection purposes and plasma diagnostics in chlorine-containing ambients where we could detect also a spatial dependence. This behavior is discussed in terms of Lieberman's global model.

Keywords: high frequency and RF discharges, optical measurements, electric and magnetic measurements

PACS: *52.70.Kz, 52.70.Ds, 52.80.Pi*

DOI: 10.1088/1009-0630/15/1/08