

O2.301 Ceramics' sheath probed using Laser Induced Fluorescence

Tuesday, 9 July 2019 11:40 (15 minutes)

See the full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/O2.301.pdf>

The sheath standing in front of different ceramics – used in Hall thrusters, where their nature is known to have an influence on the device efficiency [1] – is studied thanks to the nonintrusive Laser Induced Fluorescence (LIF) diagnostic. The study aims to provide a better understanding of the sheath structure under the presence of hot/energetic electrons that are able to trigger secondary electron emission from the ceramic wall [2]. Performing LIF in front of surfaces implies the presence of an additional LIF signal due to the presence of the reflected laser beam. We present here an experimental artifact causing the reflected beam signal to be significantly higher than the incident beam one. Erroneous measurements interpretations may be carried because of this artifact. It is shown to be due to the LIF saturation effect on one hand and the diffuse reflection of the laser beam on the surface on the other hand [3]. The exposure of this experimental bias allowed the proper measurement of the (Argon) ion velocity distribution function (IVDF) in the sheath. Several ceramics were exposed to a low pressure multipolar plasma with a variety of discharge parameters (n_e : $10^{13-15} \text{ m}^{-3}$, T_e : 2-5 eV, 10-15 % of 10-20 eV hot electrons, <5% of 50-120 eV energetic electrons) [4]. These experiments are expected to provide the first measurement of IVDF in sheaths in which the secondary electron emission is large enough for the space-charge limited (SCL) regime to appear.

[1] J-P Boeuf, Journal of Applied Physics 121, 011101 (2017)

[2] T. Tondu, M. Belhaj & V. Inguibert, Journal of Applied Physics, 110, 093301 (2011)

[3] V. Pigeon, N. Claire, C. Armas & F. Doveil, Physics of Plasmas, 26, 023508, (2019)

[4] M. Carrère, L. ChÈrigier, C. Arnas-Capeau, G. Bachet. & F. Doveil. Review of Scientific Instruments, 67, 4124-4129 (1996)

pppo

Presenter: PIGEON, V. (EPS 2019)

Session Classification: LTPD

Track Classification: LTPD