Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Application of electrostatic Langmuir probe to atmospheric arc plasmas MICHAEL KEIDAR, ALEXEY SHASHURIN, JIAN LI, TAISEN ZHUANG, The George Washington University, YEVGENY RAITSES, Princeton Plasma Physics Laboratory, ISAK BEILIS, Tel Aviv University — Relatively high pressure (about several hundred Torr) anodic arcs demonstrated its efficiency for synthesis of different types of nanostructures, such as single and multi-wall carbon nanotubes, fullerenes and graphene. Extensive interest to arc synthesized nanostructures stimulates active recent studies of high pressure anodic arcs. In this paper we apply the Langmuir probe technique for plasma parameter measurements in atmospheric pressure arcs. V-I curves of single probe were analyzed and it was observed that ratio of saturation current on positively biased probe to that on negatively biased was about 1-4, which is significantly lower than $\sim$100 predicted by conventional collisionless theory. This result can be explained by secondary electron emission from the probe due to the de-excitation of excited background gas atoms at the negatively biased probe surface. The shape of V-I curve for potentials more negative than plasma potential as well the value of saturation current are significantly deviated from that in conventional collisionless case. In this case the plasma electron temperature and plasma density no longer can be precisely determined using the standard expressions utilizing the slope of V-I curve and the ion saturation current.

Michael Keidar
The George Washington University

Date submitted: 21 Jul 2011 Electronic form version 1.4