

Singly/Negatively Charged Ion Production of a Laser Induced Plasma using a Capillary Graphite Target

Glynnis Mae Q. Saquilayan and Motoi Wada

Graduate School of Science and Engineering, Doshisha University, Kyotanabe, Kyoto 610-0321, Japan

Corresponding Author: Glynnis Mae Q. Saquilayan

e-mail address: euo1310@mail4.doshisha.ac.jp

A new type of laser ion source is currently being developed for the production of singly/negatively charged ions using a capillary graphite target. The basic target design utilizes the small dimension of the narrow conduit to constrict the plume expansion of the laser induced plasma. Focusing a Q-switched Nd:YAG laser at 20 W maximum average power and 10 Hz repetition rate, the beam is directed along the axis of the graphite tube producing a dense plasma inside of the capillary through laser ablation. The injection of neutral gas to the plasma region inside the graphite target increases the collision rate within the structure to further cool down the expanding plasma plume. Operating with the streaming neutral gas injection scheme allows the injected gas to interact with the plasma and a reduction in the bulk electron temperature can be achieved which is favorable for negative ion production. The spatial and temporal propagation of the laser induced plasma plume in a background gas flow is studied using a high speed camera. The plasma composition and ion energy distribution will be determined by employing a time-of-flight/magnetic deflection energy spectral analyzer coupled to a Faraday cup detection system. The laser parameters and suitable conditions of the streaming neutral gas injection will be investigated for the effects to singly/negatively charged ion production.

References

1. A. Mendenilla, H. Takahashi, T. Kasuya, and M. Wada, *Rev. Sci. Instrum.* **77**, 03A518 (2006).
2. S.I. Anisimov, B.S. Luk'yanchuk, and A. Luches, *Appl. Surf. Sci.* **96-98**, 24 (1996).
3. X. Wang, S. Zhang, X. Cheng, E. Zhu, W. Hang, and B. Huang, *Spectrochim. Acta B* **99**, 101 (2014).