

CHARACTERISTICS OF THE LIQUID METAL ION SOURCE WITH A SUPPRESSOR AND ITS ADVANTAGES

Byeong Seong Cho, H. J. Oh, K. B. Song,

S. O. Kang, E. H. Choi

*PDP Research Center and Dept. of Electrophysics,
Kwangwoon University, 447-1 Wolgye-Dong, Nowon-Gu,
Seoul, South Korea*

The liquid metal ion sources (LMIS) in FIB system have many advantages of high current density, high brightness and low ion energy spread. Most FIB systems use LMIS because the ion beam spot size of LMIS is smaller than of gas field ionization sources (GFIS). LMIS basically consists of an emitter (needle, anode), a reservoir (gallium) and an extractor (cathode). But several LMIS have new electrode called the suppressor.

We investigated characteristics LMIS with a suppressor, the function of the suppressor in LMIS, the change of the electric field by the suppressor and the advantages of using the suppressor.

The characteristics of the threshold voltage and current-voltage (I-V) were observed under the varying extracting voltage with floated suppressor voltage, and under the varying suppressor voltage with fixed extractor voltage. We also simulated a liquid metal ion source with the suppressor through CST (Computer Simulation Technology). The emission current increases as the suppressor voltage decreases because the suppressor voltage which restrains the electric field goes down. The threshold voltage increases as the suppressor voltage increases. We can explain characteristics and functions of LMIS with a suppressor using the electric field.

The efficiency of LMIS is described by the ion beam stability, the energy spread and the angular distribution. As a result of our research of them, we suggest that LMIS with the suppressor is more efficient than without the suppressor in FIB systems.

1. Guang-Sup Cho, Yoonho Seo, and Seung-Oun Kang, "Liquid metal ion sources : The shape and size of the ion emitting area", J. Appl. Phys. 72 (12), 15 December 1992.
2. KL Aitken and GLR Mair, "Emission characteristics of a liquid caesium ion source", J. Phys. D: Appl. Phys., 13 (1980) 2165-73.