

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Numerical analysis of ion wind flow using space charge for optimal design¹ HAN SEO KO, DONG HO SHIN, SOO HONG BAEK, Sungkyunkwan University — Ion wind flow has been widely studied for its advantages of a micro fluidic device. However, it is very difficult to predict the performance of the ion wind flow for various conditions because of its complicated electrohydrodynamic phenomena. Thus, a reliable numerical modeling is required to design an optimal ion wind generator and calculate velocity of the ion wind for the proper performance. In this study, the numerical modeling of the ion wind has been modified and newly defined to calculate the velocity of the ion wind flow by combining three basic models such as electrostatics, electrodynamics and fluid dynamics. The model has included presence of initial space charges to calculate transfer energy between space charges and air gas molecules using a developed space charge correlation. The simulation has been performed for a geometry of a pin to parallel plate electrode. Finally, the results of the simulation have been compared with the experimental data for the ion wind velocity to confirm the accuracy of the modified numerical modeling and to obtain the optimal design of the ion wind generator.

¹This work was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Korean government (MEST) (No. 2013R1A2A2A01068653).

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Date submitted: 31 Jul 2014

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