

Nanoliter size control of DNA droplet in Electrohydrodynamic (EHD) dispensing for DNA Chip

Yong-Hark Jang¹, Jin Seok Kim¹, Jeong-Gun Lee² and Jeong-Woo Choi¹

¹Department of Chemical & Biomolecular Engineering, Sogang University, 1
Shinsu-dong, Mapo-gu, Seoul 121-742, Korea

²Samsung Advanced Institute of Technology, San 14-1, Nongseo-Ri, Kihung-Eup,
Yongin-City, Gyunggi-Do, Korea

TEL: +82-2-705-8480, FAX: +82-2-3273-0331, E-mail: jwchoi@ccs.sogang.ac.kr

Abstract

In order to investigate the effect of an electric field on the dynamic behavior of pendent DNA drop, visualization experiments with three kinds of electrode shape are performed. In the experiment, dispensing volume and spot size are measured to find out the possibility of EHD bio dispensing. As a result, the hydrophobic electrode surface, the dispensing volume and spot size are remarkably decreased. In particular, much smaller dispensing volume (2 nl) and spot size are obtained in case of needle-type electrode due to the increment in strength of non-uniform electric field exerted on drop surface. At higher relative humidity of environment, spot size is rapidly increased because of reduction in evaporation rate on drop surface during the dispensing procedure. On the other hand, the spot size does not change although the concentration of DNA solution is varied with range from 1 nM to 1 M.

It is clearly shown that pathogens are detected and the significant signal levels for each of pathogenic bacteria after hybridization for 1hr at 42°C are retained. Finally, it is demonstrated that the new dispensing method for DNA microarray is achieved without loss of probe DNA by using electrohydrodynamic technique.

References

1. Jayasinghe, S. N. Edirisinghe, M. J. Wang, D. Z. "Controlled deposition of nanoparticle clusters by electrohydrodynamic atomization"(2004), *Nanotechnology* 15, 1519-1523.