**69f Formation of a Nanoliter-Sized Droplet by Ac Electric Field and Resonant Oscillation**

*Beom Seok Lee, Jeong-Gun Lee, Hye-Jung Cho, Nam Huh, and In Seok Kang*

A mechanism generating a controllable nanoliter-sized droplet under AC electric field is investigated by experiment. Here, the focus is on the effect of AC electric field at low frequency (≤ 1 kHz) and the corresponding resonant oscillation of pendant droplet. From the experiment, the electric force assists gravitational force against surface tension force in the early stage. Then the droplet is elongated in the parallel direction of the electric field. Right after capillary bridge is made between electrodes, the electric force accelerates capillary breaking and the pendant droplet is eventually disintegrated onto the lower electrode. Furthermore, it is found that there is a resonant frequency that maximizes an oscillating amplitude of the pendant droplet. At the resonant frequency, the droplet is disintegrated most rapidly among the other tested frequencies. Disintegrated volume of the droplet is mainly controlled by the shape of initial droplet and the hydrophobicity of lower electrode surface. By using different initial shape, the disintegrated volume is controlled from a microliter to a nanoliter with a single nozzle as an upper electrode (OD 460 mm). Especially for hydrophobic electrode surface, a few-hundred-picoliter volume can be obtained. As a working solution, DNA solution is also tested in addition to distilled water and the same behavior is observed. Therefore, this mechanism can be used as a new dispensing method for DNA microarray (J. G. Lee *et al*, "Nanoliter size control of DNA droplet in electrohydrodynamic dispensing for DNA microarray," Anal. Chem., *submitted*)