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Measurement of interfacial tension of ionic liquid-dielectric liquid system using the shape of an electrically deformed droplet DONG WOOG LEE, DO JIN IM, IN SEOK KANG, POSTECH — When a charged droplet of an ionic liquid is translated by uniform electric field, it is deformed into a prolate shape. The deformed shape is used for estimation of the interfacial tension of ionic liquid-dielectric liquid system. The typical Debye length of an ionic liquid is of sub-nanometer scale, while the typical radius of a droplet is about 0.5 mm. Therefore, from the electrostatics view point, the droplet can be approximated as a perfect conductor. In addition, the net charge accumulated at the droplet surface does not cause any significant change of the composition of ionic liquid. Thus, no change of interfacial tension is expected to be due to the electrical effect. The experimental configuration of the present study has also other advantages. The first is that the Reynolds number is smaller than unity and the Stokes flow limit can be applied. In this small Reynolds number regime, uniform streaming flow does not cause shape change up to the first order shape deformation. This means that to this order, the shape change is solely due to the electrical effect. The second is that net charge of a conducting droplet does not cause shape change up to the first order deformation. This means that we do not need the information about the amount of net charge of a droplet. In the experiments, the ionic liquids 1-alkyl-3-methylimidazolium alkyl sulfate ([Cn-mim] [CH3SO4] and [Cn-min] [C2H5SO4], n=2, 4, 6) are used as the droplet phase and the silicone oil KF-54(500cS) is used as the continuous phase.

Dong Woog Lee
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