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A new electrohydrodynamic flows due to field-induced conductivity gradient in dielectric liquids HYUN JIN PARK, JAE CHUN RYU, JUN KWON PARK, KWAN HYOUNG KANG[1], Dept. Mechanical Engineering, POSTECH — A dielectric liquid is often preferred as a host fluid of a colloidal system under an electric field, because one can utilize the full benefits of a strong electric field with little concern for occurrence of electrolysis. Hence, dielectric liquids have been employed in many practical applications such as electrorheological fluids, electrophoretic deposition, and electrophoretic display. Nonetheless, the dynamics of colloidal particles in dielectric liquids is poorly understood compared to that in aqueous solutions. In the present paper, we report a novel electrohydrodynamic (EHD) flow which occurs near the objects immersed in dielectric liquids containing small amounts of polar additives. We suggested that the EHD flow is generated due to a electrical conductivity gradient induced by a non-uniform electric-field. Analytical and numerical solutions are obtained and verified by comparision with experimental results. We discuss the effect of electric-field strength, particle size, and ac frequency on velocity and pattern of the EHD flow.

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