

I⁴th I²plus Seminar

Schedule: 15:00 ~, July 2nd 2015

Place: 機械工学科会議室 (2号館2階)

Speaker: Dr. Manoranjan Mishra

(Indian Institute of Technology Ropar, India)



Interfacial instability of miscible displacement flow in liquid chromatographic separation

Abstract: When the viscosity of the sample injected in a liquid chromatographic (LC) column is different from that of the carrier liquid, a hydrodynamic instability occurs at that sample/carrier interface where the more viscous fluid is displaced by the less viscous one. The latter penetrates into the more viscous zone, forming some kind of fingers, which grow as they migrate, hence the name "viscous fingering" (VF) given to this instability. Such instability may cause a distortion of the peak shapes and, generally, a decrease in separation performances. Evidence of this phenomenon in present-day LC columns has been clearly provided by the in situ optical visualization experiments. In this talk a computational study to explore the effect of the underlying physico-chemical phenomena, (effects of solvent strength, retention and viscous fingering) on the dynamics of the adsorbed solute onto the porous matrix will be presented. The second part of the talk will be on the viscous fingering dynamics between partial miscible fluids. In such cases a steep concentration gradient exists between both the miscible fluids and that gives rise to an additional stress term in the momentum equation, called Korteweg stress. Such stresses mimic a surface tension type force, which may act against the growth of the instability in viscous fingering.

Pramanik, S. & Mishra, M., Phys. Fluids 25, 074104., 2013. Rana, C., De Wit, A., Martin, M. & Mishra, M., RSC Advances, 4, PP 34369, 2014. Rana, C. & Mishra, M., J. Chem. Phys. 141, 214701, 2014. Pramanik, S. & Mishra, M. Chem. Eng. Science 122, 523, 2015. Pramanik, S. & Mishra, M. EPL 109, 64001, 2015.



Contact: I²plus (i2plus@rs.tus.ac.jp), Dr. Ueno (ich@rs.tus.ac.jp)

Organizer: International Research Div. of Interfacial Thermo-Fluid Dynamics (I²plus), RIST, TUS



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