OR-35
DROP MOTION DURING MASS TRANSFER ACCOMPANIED BY INTERPHASE CONVECTION

Anatolii Titov,[1] Zalina R. Rusinova,[1] Ekaterina A. Kalimulina,[1] Anatoliy Vorobev[2]
[1] Ural Federal University, 19 Mira St. Yekaterinburg, Russia
[2] University of Southampton, University Road, Southampton SO17 1BJ, United Kingdom
E-mail: a.g.titov@urfu.ru

Abstract. The work is deal with the experimental study of the mass transfer of acetic acid from the dispersed phase (butyl acetate) to the continuous phase (water). Researchers are continuously working on the problem of the dependence of the mass transfer coefficient on the driving force of the extraction process.[1–2]

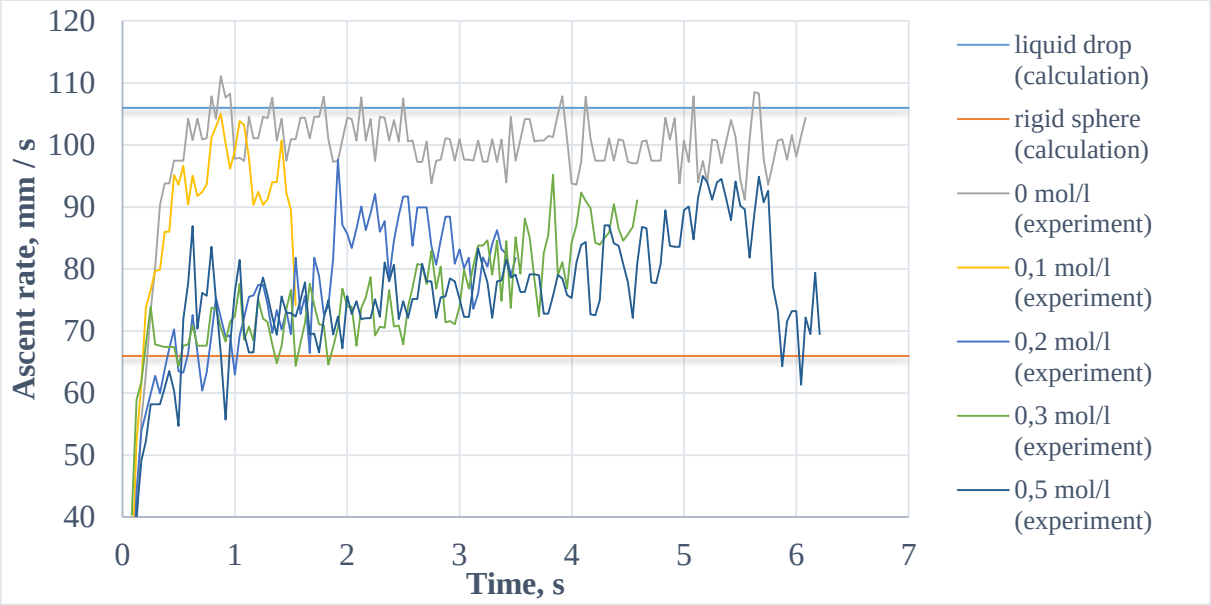

Figure 1. Dependence of the ascent rate on the process time

The Marangoni effect has a significant influence on the mass transfer of acetic acid from the dispersed phase (butyl acetate) to the continuous phase (water). The most pronounced manifestation of the effect is observed at a driving force of 0.1...0.2 mol/l. Drops with a concentration of 0.1 mol/l almost immediately deviated from the axis; at concentrations up to 0.5 mol/l, this effect influenced the motion of particles in the upper sections of the trajectories.

The Marangoni effect also affects the ascent rate of a liquid droplet. The experimental data for a liquid droplet with zero acid concentration practically coincide with the calculated data. The movement of droplets containing acid is different. As the acid concentration increases from 0.1 to 0.7 mol/l, the ascent rate decreases up to the ascent rate of a rigid sphere.

References

1. Sheikholeslami M., Chamkha A. J. Sheikholeslami M. Influence of Lorentz forces on nanofluid forced convection considering Marangoni convection. International Communications in Heat and Mass Transfer. 2020. Vol. 119.

2. Shevchenko E., Mitra S., Ermakov S., Titov A., Ermakov A., Pattader P. Joint mass transfer of two components associated with the spontaneous interfacial convection in the liquid-liquid extraction system. Chemical Engineering Science. 2019. Vol. 195, pp. 301–311.