Crystallization of Taurine by LLIP Method in High Magnetic Fields [°]Tetsuya Onotou, Naomi Yokoyama, Yuta Kimura, Ryusei Semba and Isao Yamamoto

(Yokohama Nat'l Univ.)

E-mail: onotou-tetsuya-ds@ynu.jp

LLIP (liquid-liquid-interfacial-precipitation) method is a new crystallization technique expected innovative drug development. The interface between poor and good solvents becomes supersaturated by counter diffusion. The seed crystals are produced and grown at the supersaturated layer^[1]. High magnetic fields influence the crystal growth and morphology. In our previous research, we reported magnetic field effects (MFEs) which shape and size of the taurine crystals are changed drastically as shown Figs 1 and 2^[2]. The MF controls the posture at the interface and suppresses the convection due to Lorentz force.

The interfacial tension is proportional to the crystal perimeter of the facing interface. Furthermore, the interfacial tension of mixed liquid is changed by concentration of solvent. We estimate the interfacial tension between water and ethanol by absorbance of ethanol at wavelength of 200 nm.

Fig. 3 shows the graph of concentration of ethanol and interfacial tension at the interface between water and ethanol depending on the time until 120 min. The red curve in Fig. 4 is the resultant force of gravity and buoyancy (F_{gb}), and the purple and yellow curves are the resultant force of gravity and buoyancy and faraday force ($F_{gb} \pm F_{faraday}$), and blue and black lines are interfacial tension assuming length/diameter of the postulated crystal equals 10. The critical size is estimated by diameter value of the intersection points of curve and line. The interfacial tension decreases depending on the elapsed time as explained Fig. 3. However, little change of the critical size was observed just after the formed interface and 60 min later (Fig. 4). In comparison with the results under vertical and horizontal magnetic field, the critical size made under the horizontal field is increased than that under the vertical magnetic fields. In conclusion, our experimental results suggest that the control of crystal posture influences the crystal morphology.





Fig. 1 The taurine crystals made by LLIP method (scale = 333 μ m). (a) no magnetic field B = 0 T,

(b) max gradient magnetic field B = 10 T, BdB/dz = 550 T²/m (c) horizontal magnetic field B = 13 T



Fig. 3 Concentration and interfacial tension of interface between ethanol and water dependence of time



Fig. 4 The interfacial tension and resultant force (gravity and buoyancy and faraday force) dependence of crystal diameter

References

[1] K. Kadota, J. Soc. Powder Technol, Jpn. 44, 427-433(2007).

[2] T. Onotou, T. Arashiro, R. Murase, S. Ozawa, I. Yamamoto, 62nd JSAP Spring Meeting, 11p-P1-56 (2015).