

Magnetic Field Effect on Lysozyme Crystallized by LLIP Method

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Liquid-liquid interfacial precipitation (LLIP) method is one of techniques to make a crystal. We have reported previously the vertical gradient magnetic field effects on the size and alignment for lysozyme using various precipitants such as NaCl and CoCl₂ [1, 2]. In this paper, protein was crystallized with a paramagnetic precipitant under a horizontal gradient magnetic field, and the magnetic field effect was clarified.

The lysozyme solution and precipitant solution of CoCl₂ were prepared to be pH = 8.7. The 100 μ l precipitant solution was poured into a reactor with 6.5 mm diameter. The 50 μ l protein solution was stacked gently to make the interface between them. In addition, 100 μ l liquid paraffin was stacked on the protein solution to prevent evaporation of the solutions. In this manner, the lysozyme was crystallized at 20 $^{\circ}$ C under horizontal magnetic field with/without the gradient for 24 h.

As a result, in the horizontal gradient magnetic field, the crystal was observed at a position away from the center of the magnetic field as shown in Fig. 1(a), and the size was increased compared with that in the homogeneous magnetic field of 13 T as shown in Fig. 1(b). Fig. 2 shows the size distribution of the crystal for Fig. 1(a) under the gradient magnetic field. It was found the size depended on the precipitated zone on the bottom. The huge crystals were observed on the zones 4-6. In order to study the mechanism of the size effect, the shape change of the interfaces between solutions was observed *in situ*. The interface tilted vertically was observed as indicated by broken line in Fig. 3. It is considered the growth position is important to enlarge the size since the crystal sediments obliquely according to the gravity and magnetic forces. The horizontal gradient magnetic field is a good tool to grow the crystals.

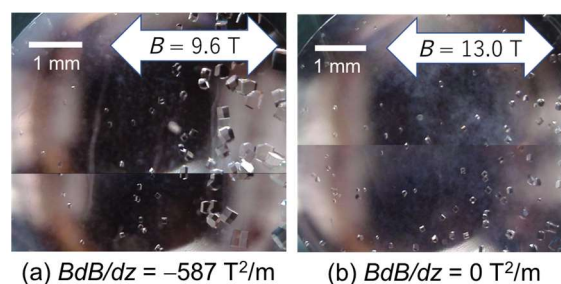


Fig. 1. The crystals precipitated under the horizontal magnetic field (bottom view).

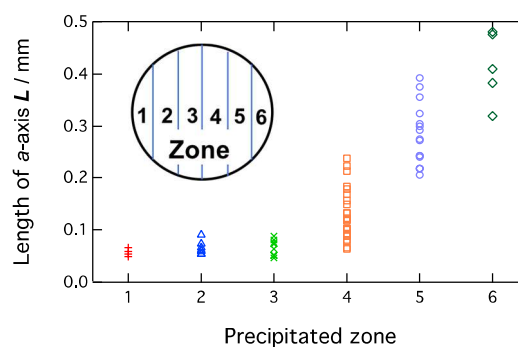


Fig. 2. The size distribution of the crystals precipitated under gradient field for Fig. 1(a).

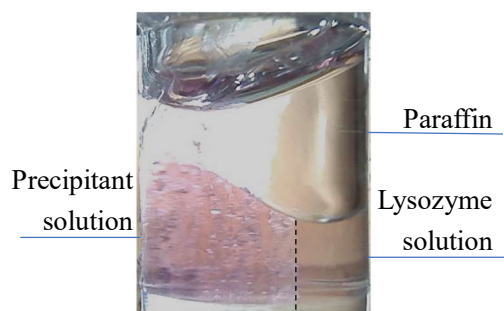


Fig. 3. The side view of the interfaces of the solutions in the reactor under horizontal gradient magnetic field.

Acknowledgments

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References

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- [2] T. Okabe, *et al.*, The 78th JSAP Autumn Meeting, 5a-C24-7.