# Magnetic Condensation of Rare Earth Ions Ⅲ

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Magnetic separation is a technology that uses magnetic force to separate a target substance from a mixture of substances.

The target of magnetic separation in this study is the paramagnetic rare earth ions. Currently, rare-earth metals are used for various applications in high-tech products, and their demand is expected to increase in the future. However, due to the uneven distribution of rare earths, China accounts for about 95% of the world supply, and Japan is currently dependent on imports from China. Therefore, the goal of this study is to establish a reuse technology for rare earths.[1]

The magnetic force for a single ion is shown in equation (1).

$$F = \kappa_{ion} B \left(\frac{dB}{dz}\right), \quad (1)$$

Figure 1 shows the experimental system. An experimental system was constructed to obtain the concentration change by observing the interference fringes of light passing through the sample using a Mach-Zehnder interferometer. An aqueous solution of the sample Dy(NO)3·6H2O (99.5% by Wako Pure Chemical) was sealed in an optical cell, and a magnetic field was applied with a Halbach array magnet. The signals obtained from the interference fringes were subjected to continuous wavelet transform, and the phase components were extracted by image analysis in MATLAB.

Figure 2 shows the results of the analysis of equal concentrations. The frequency components were detected from the luminance of the signalized interference.

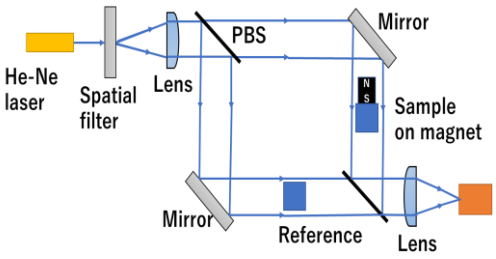


Fig.1 Schematic of Mach-Zehnder interferometer

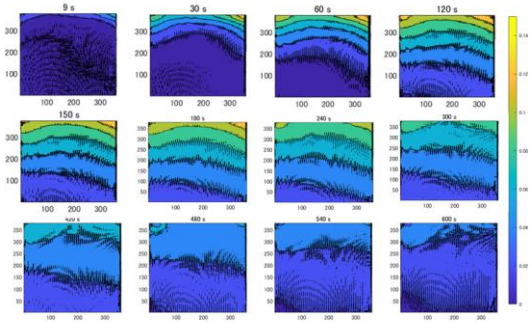

Fig.2 Time dependence of isoconcentration

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Reference : [1] Agnieszka Franczak *et al.*, Phys. Chem. Chem. Phys. 18 (2016) 27342.