Optical Change Property in Micro-inclination of Light-reflecting Surface of Biogenic Guanine Crystal under Magnetic Field

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Introduction

Biofunction of organisms is quite variable in nature. Recent researches try to apply these function and biogenic materials in the various fields, which are optics, engineering, nano-technology and so on. In particular, biogenic guanine crystal which has a feature of magnetic orientation and high light-reflection collect much attention among researchers. Also, in the nano-technology field, magnetic manipulation technique for a single molecule called magnetic tweezers [2] is advanced. So, we need to push out the frontier associated to magnetic manipulation about diamagnetic micro-materials in micro region and investigate the unique function of organisms.

In this study, we demonstrated that magnetic manipulation of light reflection from biogenic guanine crystal derived from organism in micro region was carried out by controlling inclination of guanine crystal surface with and without magnetic field.

Methods

The guanine crystal derived from goldfish is able to be extracted from fish scales. The fish scales were washed with distilled water and picked with a plastic spatula. The obtained crystals dispersed in the distilled water were used as suspension in the experiments. This suspension was enclosed in the chamber with silicon seal. The configuration which was the optical microscope (1000 magnifications), the electromagnet and a sample was able to observe the guanine crystals under magnetic fields when the angle (α) between optical microscope tube and gravity direction was changed at range of 0~30 degree.

Results and Discussion

This study reported that we observed the guanine crystal suspension in chamber and compared the changes of light reflection from guanine crystals with and without magnetic field when the angle (α) of optical microscope tube was changed at 0~30 degree.

In results, in the case of the angle (α) at 0 degree, light reflection from guanine crystals was suppressed under magnetic fields at 0.5 T. However, guanine crystals indicated magnetic orientation under magnetic fields at 0.5 T when the angle (α) is 15 degree. On the other hand, in the case of the angle (α) at 30 degree, guanine crystals had a light twinkling at the moment of applied magnetic field and indicated two kinds of magnetic orientation. In these results, it was revealed that reflection efficiency and light scattering intensity from biogenic guanine crystals was maximum when the angle (α) was 15 degree. In contrast, when the angle (α) was 0 degree, light reflection from biogenic guanine crystals was suppressed.

Acknowledgments

This study was supported by JSPS (Research Fellowship for Young scientists: DC1) “魚類由来反磁性結晶の DNA 固定による光学素子化と磁気マニピュレーション法の構築”.

Reference

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