

磁気配向磁性ナノ粒子分散液の重ね合わせ試料が示す円二色性スペクトル

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Generation of Circular Dichroism from the Superposed Magnetically Oriented Magnetic Nanoparticles (¹*Institute for NanoScience, Design, Osaka University*, ²*High Energy Accelerator Research Organization*) ○Hitoshi Watarai,¹ Hideaki Takechi²

An aqueous dispersion of iron oxide magnetic nanoparticles (MNPs) under the magnetic field of Voigt configuration showed clear magnetic orientational linear dichroism (MOLD) spectra (1), though it did not show circular dichroism (CD) under such condition. However, when two magnetized aqueous dispersion samples were superposed with the angle of 45 degrees, the maximum CD spectrum was observed. On the other hand, a film sample was prepared by evaporating water from the MNPs dispersion in polyvinyl alcohol aqueous solution on a glass slide under the magnetic field applied parallel to the surface of the glass. In the film sample, MNPs formed chains of aggregates which aligned to the direction of the magnetic field. The film sample showed the LD and the linear birefringent (LB) spectra, but no clear CD spectra as observed in the solution sample. However, the superposed sample of the two films with the angle of 45 degrees exhibited a maximum CD spectrum. These results were analyzed by using Mueller matrix simulation (2) and it was suggested that the CD spectra originated from the combination of LD and LB spectra of the superposed samples.

Keywords : *Circular dichroism; Chirality; Iron oxide magnetic nanoparticles; Magnetic orientational linear dichroism; Mueller matrix*

酸化鉄磁性ナノ粒子(MNPs)の磁気モーメントと光学遷移モーメントが同一方向をとるため、MNPsの分散液が磁気配向線二色性(MOLD)を示すことを最近報告した(1)。今回、磁気配向分散液自体は円二色性(CD)をほとんど示さないが、二つの磁気配向分散試料を重ね合わせるとCDが観測され、両者の角度が45度のときに最大となることを見出した。更に、MNPsのポリビニルアルコール分散液をカバーガラス上に展開し、ガラスに平行に磁場をかけながら乾燥させて磁気配向MNPsフィルムを作製した。フィルム中のMNPsは磁場方向に並んだ鎖状の集合体を形成していた。この試料を二枚重ねてCDを測定すると、磁場配向方向の角度が45度のときに最大のCDスペクトルを示した。別に各試料についてLDと線複屈折(LB)を測定し、LDとLBで記述したミュラー行列を用いたモデル計算(2)から推算したCDスペクトルが実験値と良い一致を示したため、CDの起源がLDとLBに由来することが示された。

1) Critical detection of agglomeration of magnetic nanoparticles by magnetic orientational linear dichroism, H. Watarai, S. S. M. Sakurai, *Langmuir*, **2020**, 36, 12414-12422.

2) Generation of circular dichroism from superposed porphyrin films, H. Takechi, H. Watarai, *Chirality*, **2021**, 1-6.