Enantio-separation of helical supramolecular assembly composed of achiral Co(II) phthalocyanine using CISS effect

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Enantio-separation is one of the purification methods that allows one to extract a given enantiomer from a racemic mixture. However, it is difficult for any known methods to separate racemic mixture of helical nanofibers. Recently, Enantio-separation phenomena for racemic solution of amino acid on vertically magnetized Ni substrate in use of this effect has been discovered. This mechanism would be based on the exchange interaction between spin-polarized electron on the edge of amino acid and electrons in vertically magnetized Ni substrate [1][2][3]. This is consistent with CISS(Chiral-Induced-Spin-Selectivity) effect, which has been reported for various chiral materials such as DNA, amino acid, helical nanofibers. With CISS effect, one can polarize an electron spin during the electron transfer process in a chiral molecule[4][5][6]. Nonetheless, so far, no one has applied this enantio-separation method for racemic mixture of helical nanofibers. Thus, we focus on the enantio-separation of helical supramolecular assemblies composed of achiral Co(II) phthalocyanine which was grown on a Si substrate with PVD (Physical Vaper Deposition) method [7].

In this study, we succeeded in growing helices with a preferred handedness depending on the magnetization direction of vertically magnetized Ni substrates. The ratio between left-handed and right-handed helices switched about 6:4 to 4:6 by changing the direction of magnet field, which implies the presence of CISS effect. In the presentation, further results will be presented and discussed.



 $\label{eq:Fig.1.} Fig. \ 1. \ (a) Chemical structure of Co(\ II \) \ phthalocyanine \\ (b) SEM image of helices composed of Co(\ II \) \ phthalocyanine in use of PVD$

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