

希土類含有セラミックス球状粒子の周期配列による 構造色発現

Structural Color by Periodic Ordering of Rare Earth-containing Ceramic Spherical Particles

東海林 千尋*、富田 恒之*¹

Abstract

Structural colors appear by specific micro-structures such as thin films, gratings, periodically ordered particles, etc. Structural colors of films fabricated by using polystyrene and SiO₂ spherical particles were reported in many papers. In this study we prepared ceramic spherical particles which contains rare earths elements, and fabricated films which show structural color by periodical ordering of the particles on glass substrates. Spherical particles contains Gd were prepared by precipitation from homogeneous solution using hydrolysis reaction of urea. Particle sizes of prepared samples were 280 and 320 nm, and size distributions of the two samples were very narrow. The samples were dispersed in water and glass substrates were immersed in the suspensions. By evaporating the water, films in which the spherical particles were assembled as close-packed structure were fabricated. The two films showed weak blue structural color. Close-packed structure of the particles were observed by scanning electron microscope. Using a halogen lamp and a multi-channel photo detector, scattering light spectra of the two films were measured.

Keyword: Structural color, Precipitation from homogeneous solution, Spherical particles, Rare-earth elements

キーワード：構造色、均一沈殿法、球状粒子、希土類元素

1. はじめに

構造色とは光の干渉・散乱・回折を利用した、可視光の波長に相当する数百ナノメートルオーダーの微細構造によって生じる発色現象で

ある。身近にはシャボン玉¹⁾、CD²⁾、オパール³⁾などの色が構造色として知られている。構造色はその微細構造が消失しない限り半永久的に発色を保つことや、毒性のある化学物質や元素を用いる必要がない⁴⁾といった利点を有する。近年では構造色が発現する材料を人工的に作製することで、構造色が持つ利点を活かしたフィルム⁷⁾や塗料⁸⁾などの研究開発が進められている。

構造色の発現メカニズムはシャボン玉⁵⁾などの薄膜干渉、玉虫¹⁾などの多層膜干渉、CD²⁾な

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*SHOJI Chihiro

東海大学大学院 理工学研究科 化学専攻

*¹TOMITA Koji

東海大学 理学部 化学科