

# 電気泳動堆積法による粒子集積コーティング膜の作製と 構造発色性材料への展開

## Preparation of Coating Films of Colloidal Arrays via Electrophoretic Deposition and Their Applications as Structurally Colored Materials

樽谷 直紀、坂田 拓也、片桐 清文

### Abstract

Structurally colored coatings are prepared from SiO<sub>2</sub> particles and black substances dispersed solutions using electrophoretic deposition (EPD) method. EPD method enabled to synthesize homogeneous and smooth structurally colored coatings on various shaped materials in minute timescale, which is difficult in the case of conventional evaporation-based methods. Although negatively charged SiO<sub>2</sub> particles are deposited on anode substrate, the addition of polycations enables cathodic EPD which is adequate for application scene. The order of SiO<sub>2</sub> particles is controllable from long-range-ordered colloidal crystal structures to short-range-ordered colloidal amorphous structures depending on the condition of precursor solution, such as solution pH. We found that robustness of structurally colored coatings are drastically improved when Mg(NO<sub>3</sub>)<sub>2</sub> was dissolved in the precursor solution. Mg<sup>2+</sup> adsorbed on SiO<sub>2</sub> particles are react with OH<sup>-</sup> anions, produced by electrolysis of H<sub>2</sub>O and NO<sub>3</sub><sup>-</sup>, to form magnesium hydroxides. Formed magnesium hydroxides bind SiO<sub>2</sub> particles and substrates, which improves robustness of coatings. Structural colored coatings by EPD method shown here have a great potential for industrial application because of its advantages; homogeneous coating on various shaped materials, minute-scale short processing time, controlled color and tone, and enough robustness for handling.

キーワード：構造色、電着塗装、コロイド結晶、コロイドアモルファス集積体

**Keywords** : Structural color, Electrophoretic painting, Colloidal crystal, Colloidal amorphous array

### 1. はじめに

我々の暮らしを豊かにする様々なモノには多彩なカラーリングがなされている。古代ギリシャ時代の神殿は、建設当時、その上部は赤や

青などの彩色がされていたと伝えられている。現代においても色は様々なかたちで活用されている。例えば自動車は多彩な色で塗装されており、その自動車の運転者に情報を提供する交通標識では、一旦停止などの規制標識は赤色、警

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TARUTANI Naoki, SAKATA Takuya, KATAGIRI Kiyofumi  
広島大学 大学院先進理工系科学研究科 応用化学プログラム