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学位論文題目	Preparation, Photophysical and Electrochemical Properties of Eu(III) Complex-Smectite Hybrid Material (Eu(III)錯体-スメクタイト複合材料の調製と光物理および電気化学特性)
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### 論 文 内 容 の 要 旨

Eu(III) complexes with red luminescence have promising potential in photo-functional materials such as light-emitting diodes, sensors and bioimaging. The development of luminescent hybrid materials incorporating Eu(III) complexes into a matrix have been conducted to enhance emission properties and photochemical stabilities of Eu(III) complexes alone. Smectite, a type of clay, with high ion exchange capacity and excellent stability, serves as an excellent matrix for various applications. However, the research on photophysical properties of Eu(III) complexes hybridized with clay is not very comprehensive. In this research, an efficient luminescent hybrid materials were prepared by hybridizing the Eu(III) complex with smectite. In this hybrid solution system, the Eu(III) complex exhibited high emission intensity (>1.4 times) and improved quantum efficiency interacted with smectite. After studying the photophysical properties of the Eu(III) complex-smectite hybrid material, its electrofluorochromic (EFC) properties were investigated via the changes in emission properties induced by electrochemical redox reactions. EFC device based on Eu(III) complexes have sparked significant scientific interest. The smectite was used to immobilize a luminescent Eu(III) complex and an electrochromic viologen derivative ( $HV^{2+}$ ) on an electrode to construct a novel display device. The red emission from Eu(III) complex was observed in the bleached state of  $HV^{2+}$ . The electrochemically colored  $HV^{+}$  species (cyan color) quenched the red emission of the Eu(III) complex by applying voltage. This emission intensity change was achieved via both energy transfer from the excited state of Eu(III) complex to the reduced state of  $HV^{+}$  and reabsorption of the luminescence by the colored  $HV^{+}$  species. This modulation of electrically controlled emission and coloration in clay matrix offers the possibility for the advanced electrochemical display devices.