

平成 27 年度「若手教員等研究支援費（若手教員等支援枠）」研究成果報告書

研究課題	吸収・発光分光による教育研究及び物性研究		
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CITI Japan 研究倫理 e-ラーニングプログラムの受講 <input checked="" type="checkbox"/> ←受講済の場合はチェックをすること			
【研究成果の概要】 （文字の大きさ 9 ポイント・字数 800 字～1600 字程度） <p>In this research, an optical (ultraviolet-visible light) spectrometer was set up and applied for the development of educational materials regarding light sources, and for solid-state physics research.</p> <p>Artificial light sources are an indispensable part of our modern society, literally bring light into the night. During the evolution of human society, light sources have undergone several revolutionary changes; from the sun to bare fire, gas lights, electric light bulbs, gas-discharge lamps and the recent highly-efficient light emitting diodes (LEDs). In this research, the optical emission spectrum from different types of light sources was measured. Each type has a different optical spectrum, related to the different physical mechanism used for light emission. This data will be used to develop teaching materials that help to understand the different light sources and their physical background. It is planned to incorporate this in the 専修物理学実験 seminar.</p> <p>The spectrometer was also used for researching the evolution of thin films of light-sensitive organic molecules during light exposure. The organic semiconductor pentacene is widely researched as a model system for organic electronic devices, for example solar cells. A cost-effective way for preparing thin-films of pentacene is to coat a substrate with a light-sensitive precursor by spin-coating, then convert it to pentacene by light exposure. The optical reflection spectrum and the X-ray reflectivity curve of the thin film during the light exposure was observed. Using this data the structural and chemical evolution was clarified, which helps to understand the conversion of the thin film during light exposure. Part of this research was conducted as a 4th-year graduation project.</p> <p>Another system that was investigated is the evolution of a thin film of photo-responsive polymer molecules during light exposure. This type of molecule is investigated for its possible application in the development of molecular machines, because it changes its shape when exposed to ultraviolet light. Changes in the optical reflection spectrum were observed during the exposure. The correlation of these changes with those that occur in the X-ray reflectivity curve, which was simultaneously recorded, is expected to clarify the structural changes. The data is currently being analyzed.</p> <p>（概要和訳）本研究では、紫外線・可視光の小型分光器を整備し、照明に使われている光源の教材開発及び有機分子薄膜の形成に関する研究に応用した。 光源の教材開発では、LED、電球、蛍光灯などの異なる光源の発光スペクトルを測定した。これらのスペクトルの特徴を基にそれぞれの物理的な発光原理について学べる教材を開発する。 有機分子薄膜の研究では、太陽電池などに用いられている有機半導体膜の形成過程での可視光分光スペクトルと X 線の反射率曲線を測定し、これらの変化を解析した。この研究の一部は 4 年生の卒業研究で行われた。その他の有機物薄膜の試料も測定した。</p>			
【研究成果発表方法】 - 「時分割 X 線反射率測定による薄膜形成の観察」, W. Voegeli <i>et al.</i> , 新学術領域「3D 活性サイト科学」第三回成果報告会, 2016 年 3 月 7 日(口頭発表) - 「可視・紫外分光による有機物薄膜の光変換の観察」, 三浦卓也, 卒業研究発表会, 2016 年 2 月 6 日			