

可視光励起型 NIR 発光性ネオジム錯体の合成

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Development of Visible-Light-Induced NIR Luminescent Nd Complexes with an Asymmetrical Ligand (¹College of Science and Engineering, Aoyama Gakuin University)

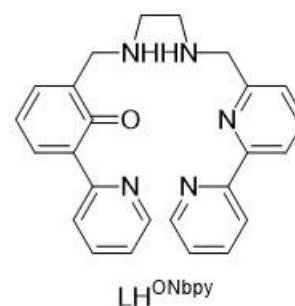
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Since the scattering of near-infrared (NIR) light is relatively low compared to that of UV-visible light, the tissue penetration of NIR light into the living body is efficient. When considering the application of NIR emitters to living organisms, it is desirable that the wavelength of the excitation light is in the visible light region. We have been working on the synthesis of a series of rare-earth complexes that are stable in solution using multidentate ligands.¹⁾ There are few examples of systems that exhibit visible light excited NIR luminescence and maintain the chelating effect. In this study, we focused on the planarity and asymmetry of the molecular structure as a molecular design strategy for rare-earth complexes exhibiting visible light excited NIR emission. Specifically, we synthesized ligands LH^{ONbpy} and rare-earth complexes with 2-(pyridin-2-yl)phenol and 2-2'-bipyridine as π -electron frameworks and cross-linked them with ethylenediamine. EuLH^{ONbpy} shows a characteristic of Eu ff emission when excited at 300 nm. NdLH^{ONbpy} shows ff emission at 1050 nm when excited at 375 nm. The point is that the ligands in this system can act as optical antennas not only for UV excitation but also for visible light, promoting visible to near-infrared ff emission. The electronic spectra and structures of these materials will be reported in detail.

Keywords : Lanthanide Complex; Near-Infrared Luminescence; Asymmetrical Ligand;

近赤外 (NIR) 光の散乱は、紫外-可視光と比べ比較的小さため、生体への組織透過性が高い。NIR 発光体の生体への応用を考慮した場合、励起光の波長が可視光領域であることが望ましい。私たちは、多座配位子を用い溶液中でも安定な一連の希土類錯体の合成に取り組んできた。¹⁾可視光励起型 NIR 発光を示し、キレート効果を保つ系の例は少ない。本研究では、可視光励起型 NIR 発光を示す希土類錯体の分子設計戦略として、分子構造の平面性と非対称性に着目した。

具体的には、 π 電子骨格として 2-(pyridin-2-yl)phenol および 2-2' bipyridine を有し、それらをエチレンジアミンで架橋した配位子 LH^{ONbpy} および希土類錯体を合成した。EuLH^{ONbpy} は 300 nm で励起すると Eu 特有の ff 発光を示す。NdLH^{ONbpy} は、375 nm で励起すると 1050 nm に ff 発光を示す。すなわち、本系は紫外線励起だけでなく、可視光でも配位子が光アンテナとして機能し、可視から近赤外の ff 発光を促すことができる。当日はこれらの電子スペクトルおよび構造について詳細を報告する。



1) M. Hasegawa, H. Ohmagari, *Chem. Lett.* **2020**, 49, 7, 845-854.