

## CPL and CD spectra of achiral Eu(III) complex in solution containing amino acids

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[Eu(pda)<sub>2</sub>]<sup>−</sup> (pda: 1,10-phenanthroline-2,9-dicarboxylic acid) exhibits emission assignable to the f-f transition in the metal center. The Eu complex does not exhibit circularly polarized luminescence (CPL) in an aqueous solution as expected from its achiral structure. However, it exhibits circularly polarized luminescence (CPL) in aqueous solutions containing chiral amino acids such as arginine and histidine.<sup>1</sup> This indicates that interactions between the [Eu(pda)<sub>2</sub>]<sup>−</sup> and amino acids induce the structural change of [Eu(pda)<sub>2</sub>]<sup>−</sup> from achiral- to a chiral structure. However, the detail of the chiral structure is still unclear. In this study, we investigated CD spectra of [Eu(pda)<sub>2</sub>]<sup>−</sup> in aqueous solutions to elucidate the structure of the complex in the solutions containing amino acids.

Figure 1a shows CD spectra of [Eu(pda)<sub>2</sub>]<sup>−</sup> in aqueous solutions containing arginine at the concentrations of 0.51-101 mM. It has an intense CD peak at 340 nm, which is assigned to  $\pi\pi^*$  transition in the phenanthroline moiety. The aspect of the concentration dependence of  $\Delta\epsilon$  for the CD at 340 nm is very close to the concentration dependence of  $g_{\text{lum}}$  values of the CPL (Figure 1b)<sup>1</sup>. This indicates that the species exhibiting CD spectra are identical to those exhibiting the CPL signals. The CD spectra are well in accord with that expected from TDDFT calculation for [Eu(pda)<sub>2</sub>]<sup>−</sup> with *D*<sub>2</sub> structure (Figure 1c). CD spectra of solutions containing L-histidine show opposite signs of that for the solution of arginine. This indicates that the structure of [Eu(pda)<sub>2</sub>]<sup>−</sup> in the histidine solution is different from that in the arginine solution although their CPL spectra are close to each other.

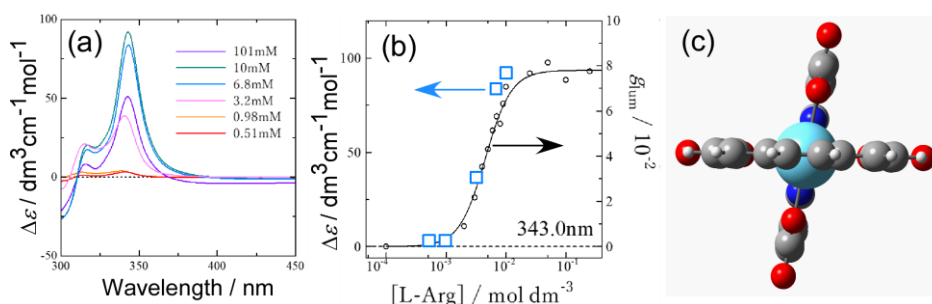


Figure 1 (a) CD spectra of [Eu(pda)<sub>2</sub>]<sup>−</sup> in aqueous solutions containing L-arg at various concentrations. ([Eu] = 0.1 mM, [Arg] = 0.51 mM - 10 mM) (b) Concentration dependence of  $\Delta\epsilon$  and  $g_{\text{lum}}$  (c) Expected structure of [Eu(pda)<sub>2</sub>]<sup>−</sup> in solution containing L-arg.

**Ref.** 1) K. Okutani, K. Nozaki, M. Iwamura, *Inorganic Chemistry* **2014**, 53, 5527.