Application Note

CD-0031

CPL measurement of camphorquinone using CPL-300 circularly polarized luminescence spectrometer

Introduction

Camphorquinone is one of the first molecules which for the CPL spectrum was reported[1], but recently even its CPL spectrum simulation, by the theoretical calculation, had been made possible[2,3]. In this application note, we present the measurement and analysis of camphorquinone using circular dichroism and circularly polarized luminescence, as a way to show the CPL-300 capabilities and the complementary features of the two techniques.

Keyword: CD, CPL, Camphorquinone

Experimental Condition

Sample: 18 mM ethanol solution of (*1R*)-(−)- and (*1S*)-(+)-camphorquinone
Cell: Optical path length 10 mm cylindrical cell

[J-1500] g_{Abs} is calculated based on CD and absorbance spectra.

Data acquisition interval:	0.1 nm	Bandwidth:	1 nm
Scan speed:	50 nm/min	Response:	2 sec
Accumulation:	1 time		

[CPL-300] g_{lum} is calculated based on CPL and fluorescence spectra.

Excitation wavelength:	440 nm	Data acquisition interval:	0.1 nm
Excitation bandwidth:	16 nm	Emission bandwidth:	10 nm
Scan speed:	50 nm/min	Response:	4 sec
Accumulation:	16 times		

Results

Molecular orbital in excited state and ground state are generally different. Therefore, CPL measurement, which reflects excited state molecular structure, and CD measurement, which reflects structure in ground state, are used as complementary methods. CD signal and CPL signal are normalized as $g_{Abs}=\Delta\varepsilon/\varepsilon$ and $g_{lum}=\Delta I/I$, respectively. CPL and fluorescence spectra of (1R)-(−)- and (1S)-(+)-camphorquinone were measured using a CPL-300, while CD and absorption spectra were collected with a J-1500; then g_{Abs} and g_{lum} had been calculated. The spectra are shown in Fig.1-(a), (b), (c).

These results are in good agreement with CPL spectrum of the camphorquinone previously reported. CPL (as ΔI) and g_{lum} show the proper mirror symmetrical spectra between (1R)-(−)- and (1S)-(+)-camphorquinone. This symmetry is kept even in the wavelength region where signal strength becomes near to zero.

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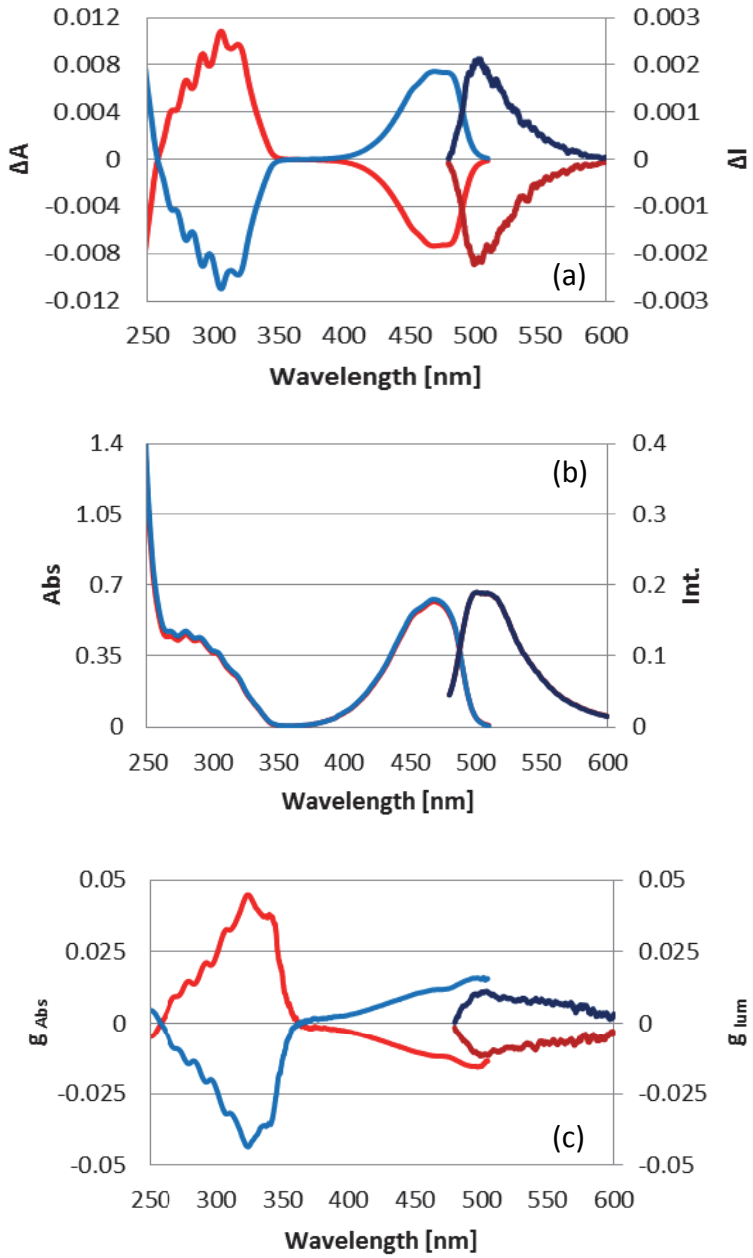

Fig.1 Spectra of camphorquinone ethanol solution, CD and CPL spectra (a), absorbance/fluorescence spectra (b), g_{Abs} and g_{lum} spectra (c)

References

(1) Chun Ka Luk and F. S. Richardson, *J. Am. Chem. Soc*. **1974**, 96, 2006-2009
(2) Benjamin Pritchard and Jochen Autschbach, *ChemPhysChem*, **2010**, 11, 2409-2415
(3) Giovanna Longhi, Ettore Castiglioni, Sergio Abbate, France Lebon, and David A. Lightner, *Chirality*, **2013**, 25, 589-599

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