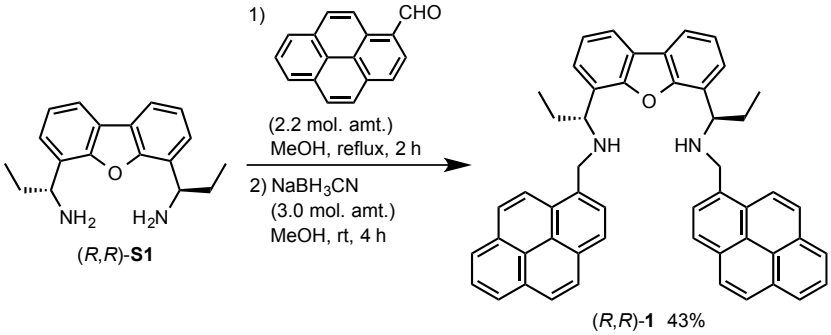
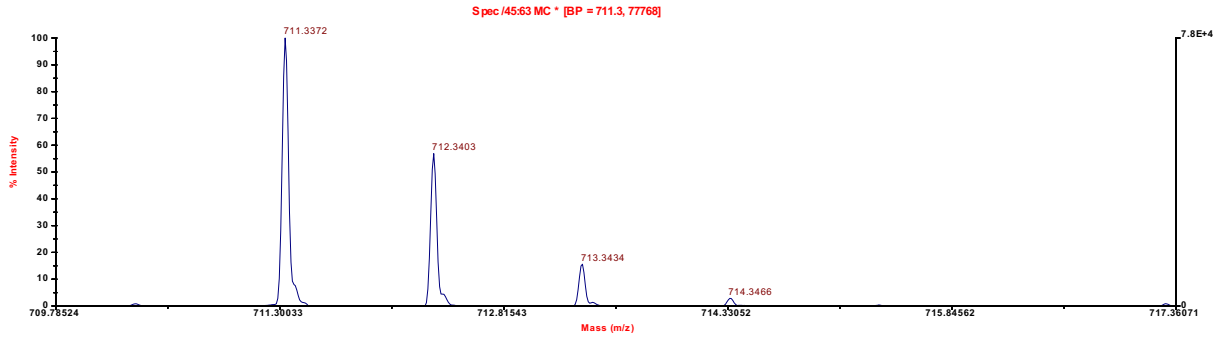
Table of contents

1. Synthesis of (*R*,*R*)-1A



Scheme S1. Synthesis of chiral diamine (*R*,*R*)-**1**

HRMS data for (*R*,*R*)-**1**



Calcd., $[M+H]^+$, 711.3375, Found, 711.3372

Molecular Formula	Monoisotopic Mass	ppm	mda	unsaturation
$C_{52}H_{43}N_2O_1$	711.3375	-0.47659	-0.33901	32.5

2. Single-particle level observations and the measurement of fluorescence lifetimes

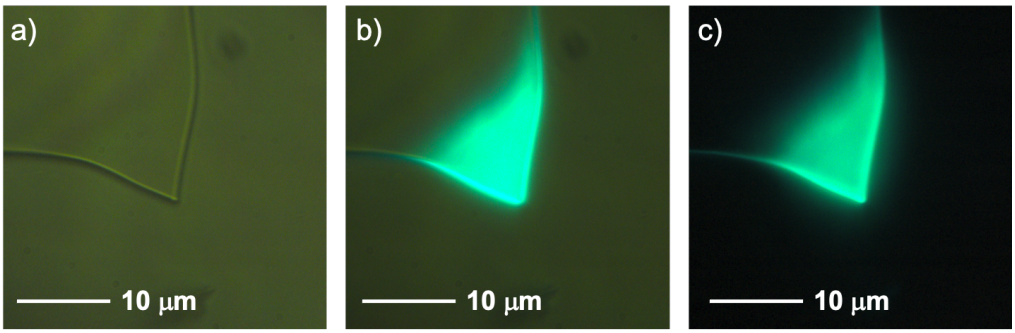


Figure S1 Photographs of as-prepared (*R*,*R*)-**1A** measured by fluorescence microscope. a) Under room light. b) Under room light excited with 405-nm continuous wave laser. c) In the dark excited with 405-nm continuous wave laser.

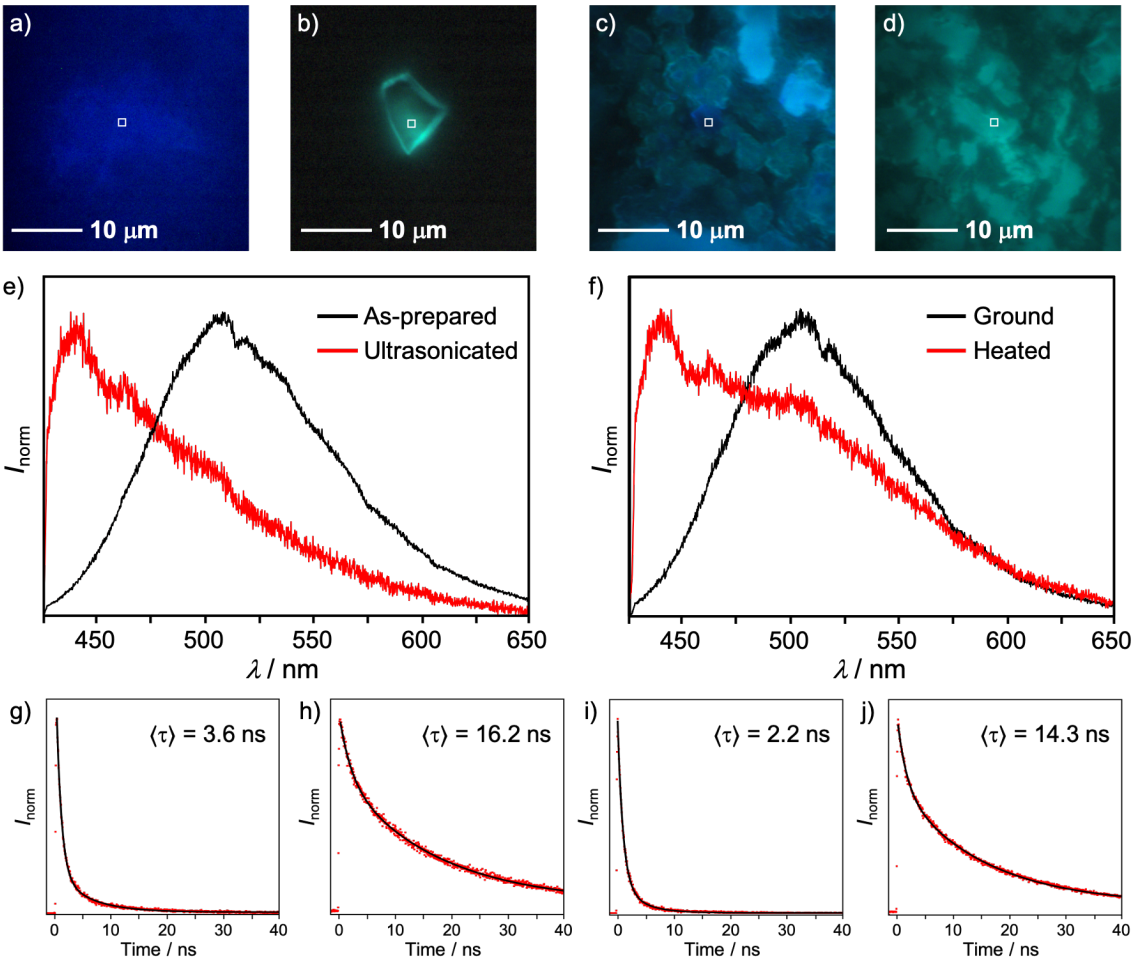


Figure S2 Photographs, fluorescence spectra, and fluorescence decay profiles for ultrasonicated (a, e, and g), as-prepared (b, e, and h), heated (c, f, and i), and ground (d, f, and j) samples of (*R*,*R*)-**1** measured by fluorescence microscope. The square marks in the photographs indicate the measured locations. Excitation wavelength is 405 nm.

Table S1. Fluorescence lifetime (τ_n), intensity-weighted mean fluorescence lifetime ($\langle\tau\rangle$), and radiative (k_r) and non-radiative rate constants (k_{nr}) of ultrasonicated, as-prepared, ground, and heated samples of (*R*,*R*)-1.[a]

Sample	λ_{em} (nm)	τ_1 (ns)[b]	τ_2 (ns)[b]	$\langle\tau\rangle$ (ns)[c]	k_r (10^8 s^{-1})[d]	k_{nr} (10^8 s^{-1})[d]
As-prepared	508	2.06 (0.308)	17.0 (0.653)	16.2	0.3	0.3
Ultrasonicated	438	0.89 (0.941)	5.60 (0.204)	3.6	0.2	2.6
Ground	504	1.65 (0.340)	15.1 (0.605)	14.3	0.3	0.4
Heated	439	0.94 (0.866)	3.76 (0.167)	2.2	0.4	4.2

[a] Excitation wavelength for the measurement of the fluorescence lifetime is 405 nm. [b] The coefficient a_n of the component is shown in parentheses. [c] Intensity-weighted mean fluorescence lifetime. $\langle\tau\rangle = (a_1\tau_1^2 + a_2\tau_2^2)/(a_1\tau_1 + a_2\tau_2)$. [d] k_r and k_{nr} were calculated from $\Phi_F = k_r/(k_r + k_{nr}) = \langle\tau\rangle k_r$.

3. Absorption and excitation spectra

The absorption bands of as-prepared, ultrasonicated, and ground samples of (*R*,*R*)-**1** were observed in almost the same region (Figure S3).

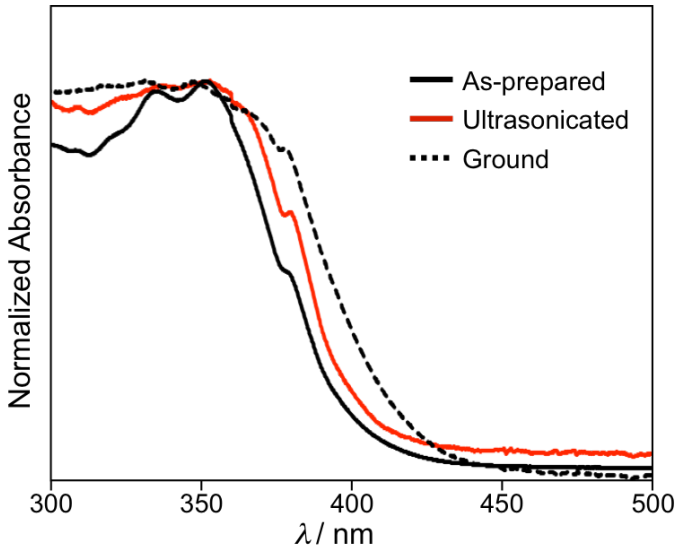


Figure S3 Solid-state absorption spectra of as-prepared, ultrasonicated, and ground samples of (*R*,*R*)-**1**.

The excitation maxima of as-prepared, ultrasonicated, and ground samples of (*R*,*R*)-**1** were also observed in almost the same region (Figure S4).

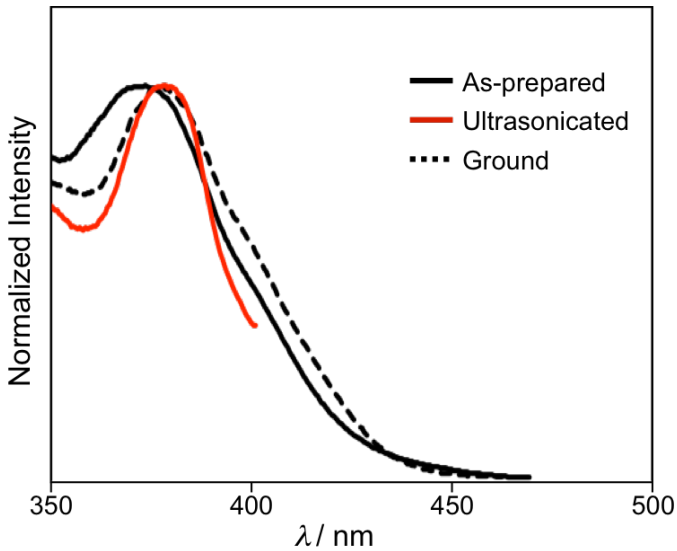


Figure S4 Solid-state excitation spectra of as-prepared (black line; λ_{em} = 483 nm), ultrasonicated (red line; λ_{em} = 413 nm), and ground (black dotted line; λ_{em} = 483 nm) samples of (*R*,*R*)-**1**.

4. Fluorescence spectra and PXRD patterns for ground and heated samples

Powder X-ray diffraction (PXRD) analysis showed the amorphization of crystal structures upon grinding ultrasonicated (*R*,*R*)-**1**. The intensity of diffraction patterns increased by heating the ground sample to 150 °C (Figure S5).

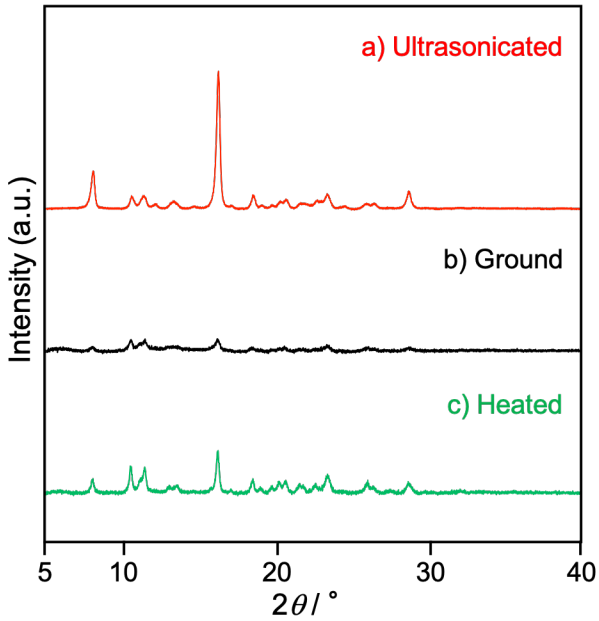
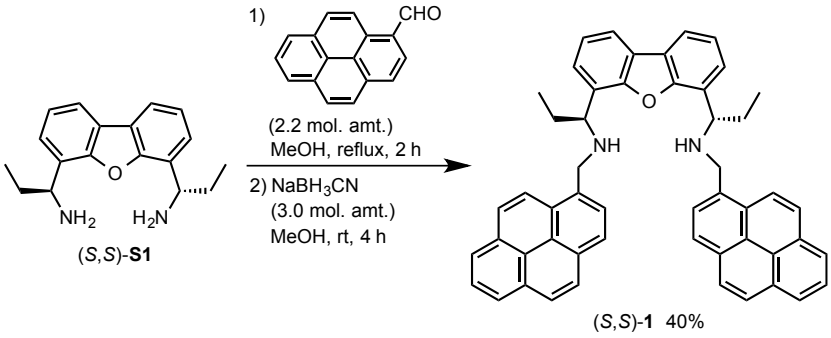


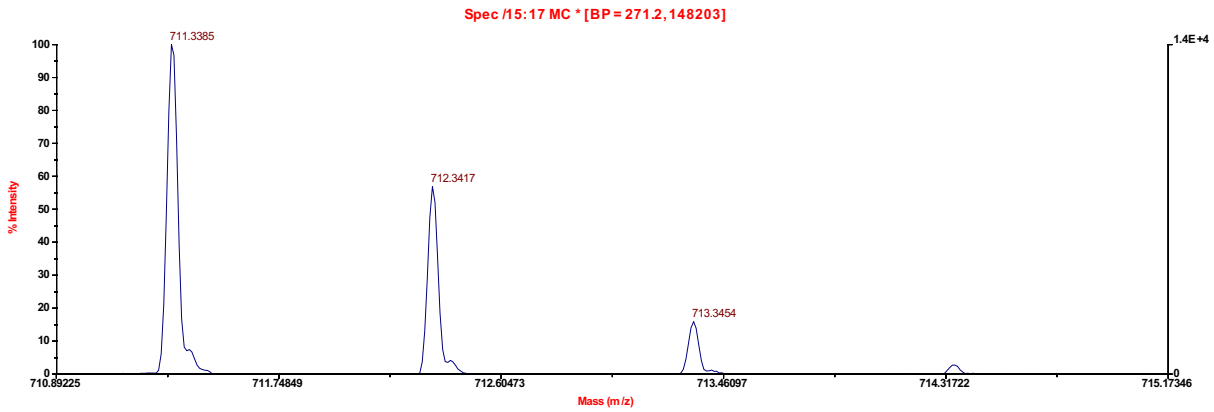
Figure S5 PXRD patterns for a) ultrasonicated, b) ground, and c) heated samples of (*R*,*R*)-**1**.

5. Synthesis of (*S*,*S*)-1



Scheme S2. Synthesis of chiral diamine (*S*,*S*)-**1**

HRMS data for (*S*,*S*)-**1**



Calcd., $[M+H]^+$, 711.3375, Found, 711.3385

Molecular Formula	Monoisotopic Mass	ppm	mda	unsaturation
$C_{52}H_{43}N_2O_1$	711.3375	1.350956	0.960986	32.5

6. Fluorescence spectra for the MCL of (*S*,*S*)-1

Fluorescence spectra for the MCL of (*S*,*S*)-**1** were in good agreement with those of (*R*,*R*)-**1** (Figure S6).

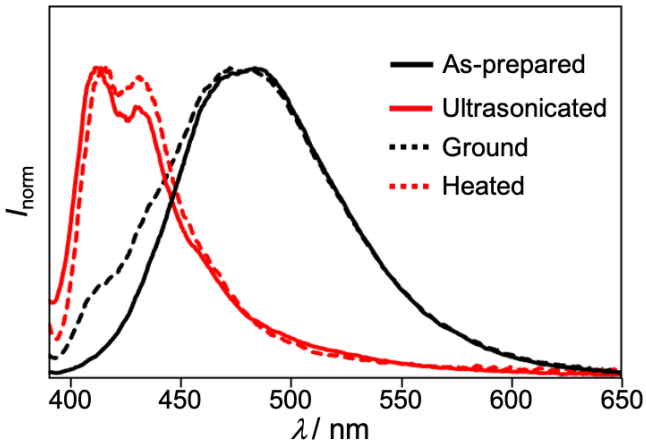
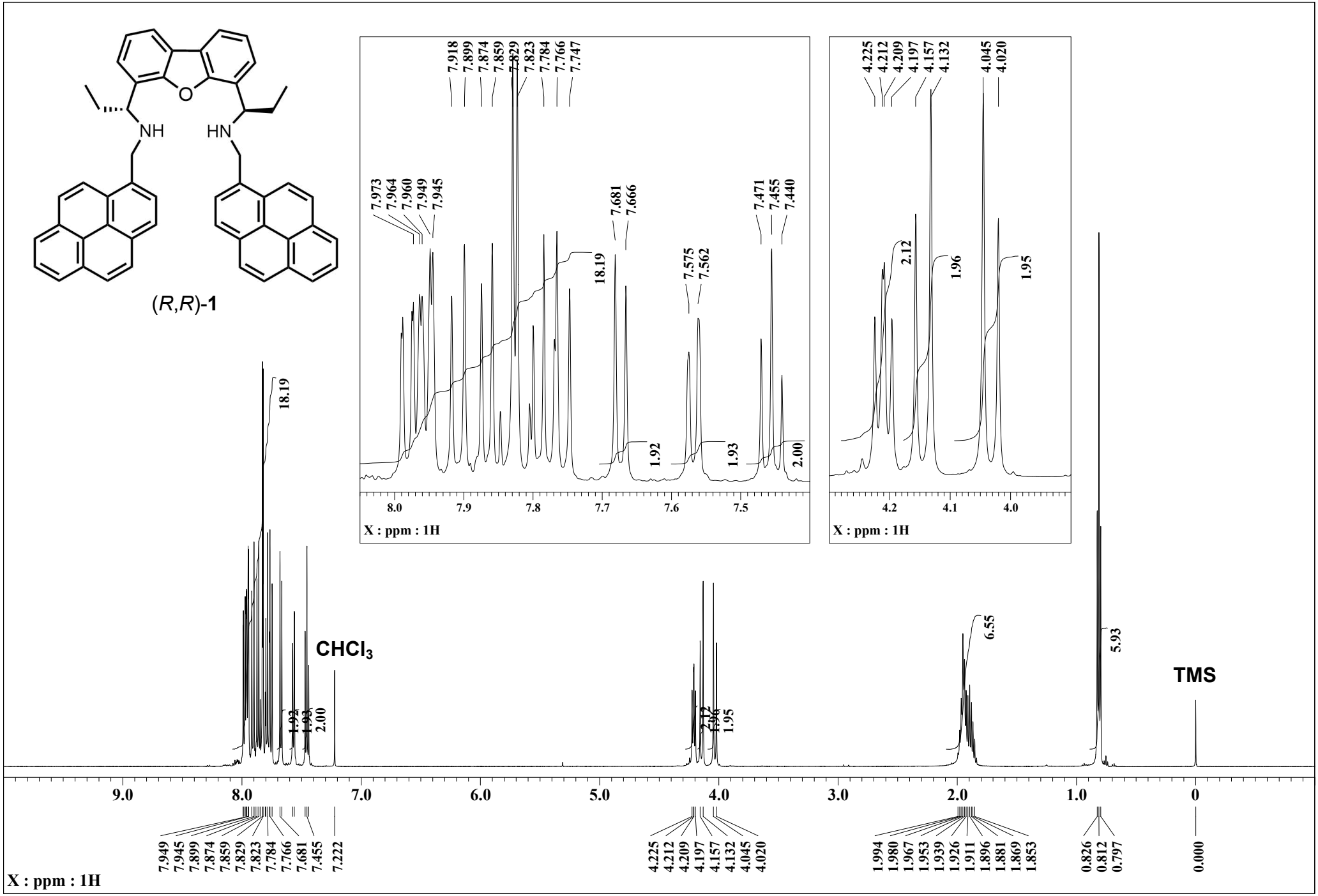
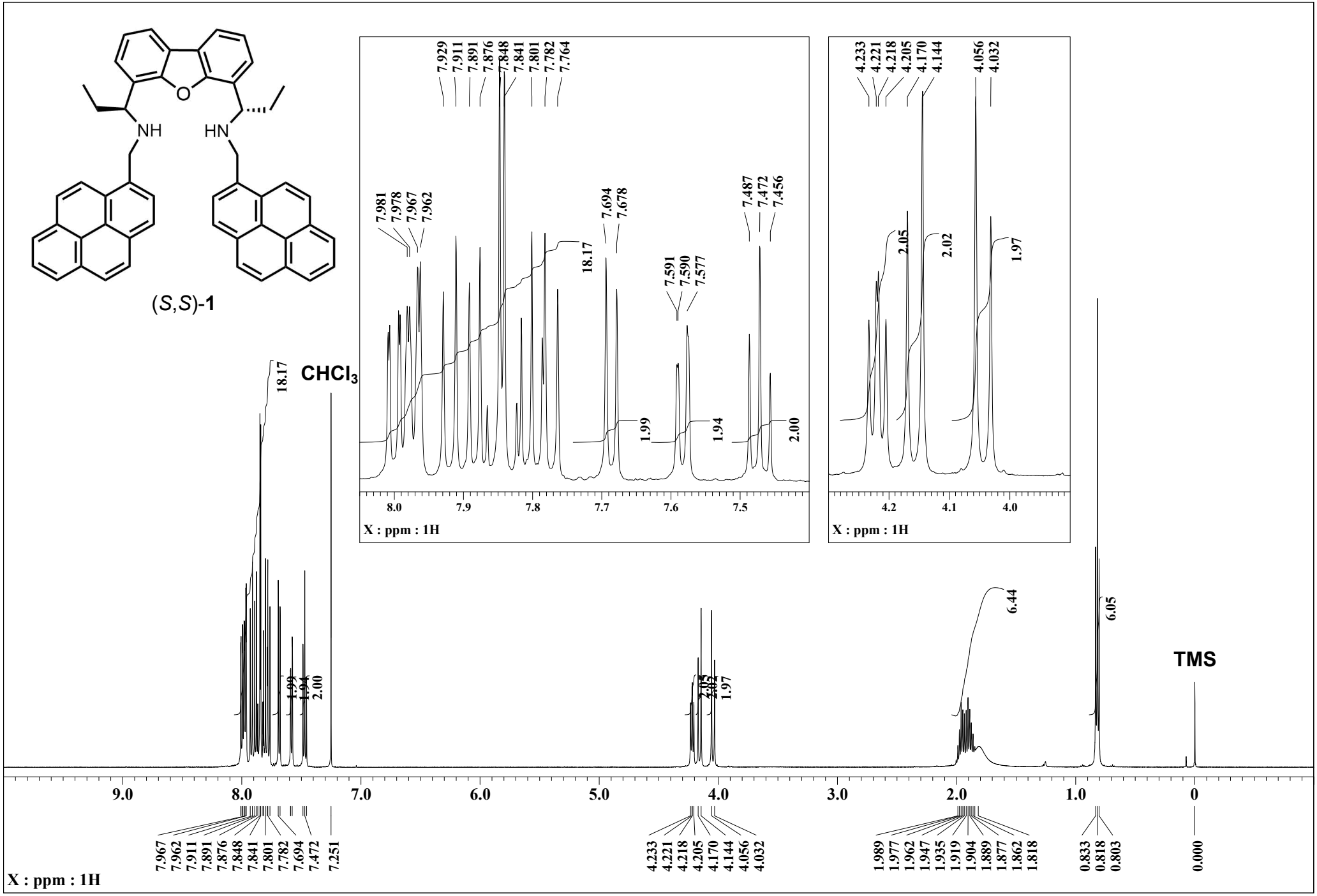


Figure S6 Fluorescence spectra for as-prepared, ultrasonicated, ground, and heated samples of (*S*,*S*)-**1**. Excitation wavelength is 365 nm.

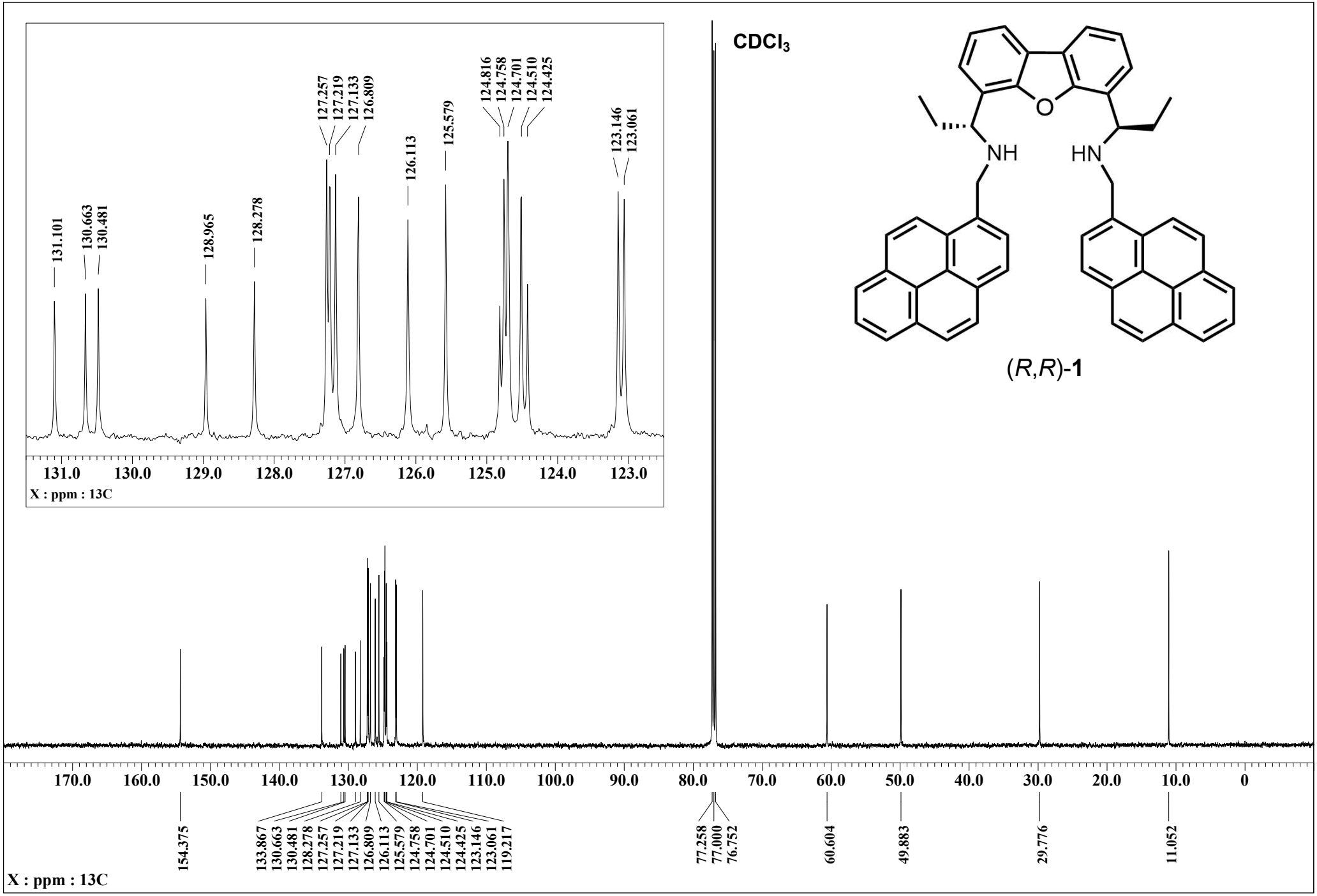
^{1}H NMR spectrum of (*R*,*R*)-1 (500 MHz, in $CDCl_3$, rt)



^{1}H NMR spectrum of (*S*,*S*)-1 (500 MHz, in $CDCl_3$, rt)



^{13}C NMR spectrum of (*R*,*R*)-1 (126 MHz, in $CDCl_3$, rt)



^{13}C NMR spectrum of (*S*,*S*)-1 (126 MHz, in $CDCl_3$, rt)