Supporting Information

Synthesis of helical quinone derivatives from oxidative coupling of substituted 2-hydroxybenzo[c]phenanthrenes

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**Spectroscopic Data:** FTIR-ATR spectrum of 5 (a-g) were measured by JASCO FT/IR 4200 (ATR PRO-450-S), Japan.

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A Varian NMR System 500 (Varian LTD) at 500 MHz and 125 MHz took $^1$H NMR and $^{13}$C NMR spectra respectively.
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3a

OCH₃

3b

H₃C

OCH₃
Supporting Information

3c

3d
Supporting Information

4b

4c
Supporting Information

4f

4g
Supporting Information

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{structure_5c}
\caption{Structure of 5c.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{spectrum_5c}
\caption{NMR spectrum of 5c.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{structure_5d}
\caption{Structure of 5d.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{spectrum_5d}
\caption{NMR spectrum of 5d.}
\end{figure}
All the mass spectrums were taken by the using of JEOL JMS-777V and JSM-700V series mass spectrometer with Electron Ionization (EI) technique.
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[Mass Spectrum]
Data: C5505100022
Sample: C507
Note: 

Spectrum Type: Normal Ion (5P-Linear)
RT: 3.00 min
Scan #: (5555)
SP: m/z 742
Inc.: 116.12 (120.16)
Output m/z range: 50 to 750
Cut Level: 0.00 %

Calculated mass: 739.9986
Observed mass: 739.9974

[Mass Spectrum]
Data: C5505100032
Sample: C506
Note: 

Spectrum Type: Normal Ion (5P-Linear)
RT: 3.42 min
Scan #: (95.95)
SP: m/z 742
Inc.: 116.12 (120.16)
Output m/z range: 50 to 750
Cut Level: 0.00 %

Calculated mass: 584.1776
Observed mass: 584.1783
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4a

OH

Calculated mass: 244.0888
Observed mass: 244.0886

4b

H₂C

Calculated mass: 258.1044
Observed mass: 258.1044
Supporting Information

4c

[Mass Spectrum]
Data: C-6-EU-UM022 Date: 03-Oct-2018 17:07
Sample: C-nc
Note:
Inlet: Direct Ion Mode: EI-
Spectrum Type: Normal Ion [MF-Linear]
RT: 0.96 min Scan#: (24,43)
BP: m/z 272 Int.: 238.61 (2500000)
Output m/z range: 50 to 350 Cut Level: 0.00 %

Calculated mass: 272.1201
Observed mass: 272.1202

4d

[Mass Spectrum]
Data: C-6-EU-UM031 Date: 02-Oct-2018 15:09
Sample: C-nc
Note:
Inlet: Direct Ion Mode: EI+
Spectrum Type: Normal Ion [MF-Linear]
RT: 1.09 min Scan#: (27,30)
BP: m/z 300 Int.: 323.58 (3288.32)
Output m/z range: 50 to 300 Cut Level: 0.00 %

Calculated mass: 300.1514
Observed mass: 300.1513
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**4e**

Calculated mass: 321.9993  
Observed mass: 321.9998

**4f**

Calculated mass: 294.1044  
Observed mass: 294.1043
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**4g**

Calculated mass: 372.0149
Observed mass: 372.0145

**3a**

Calculated mass: 258.1044
Observed mass: 258.1042
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3d

![Mass Spectrum](image)

Calculated mass: 314.1670
Observed mass: 314.1669

3e

![Mass Spectrum](image)

Calculated mass: 336.0149
Observed mass: 336.0145
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3f

Calculated mass: 308.1201
Observed mass: 308.1197

3g

Calculated mass: 386.0306
Observed mass: 386.0302
Supporting Information

2a

Calculated mass: 260.1201
Observed mass: 260.1202

2b

Calculated mass: 274.1357
Observed mass: 274.1363
Supporting Information

Calculated mass: 310.1357
Observed mass: 310.1363