**SYNTHESIS OF OCTAHYDRO-QUINOLINES THROUGH THE LEWIS ACID
CATALYZED REACTION OF VINYL-ALLENES AND IMINES**

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General experimental procedures	S2
Copies of ¹H and ¹³C NMR spectra* of compounds 4, 8-12	S3
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For compounds 4, 9, 10, 14, 16, 17, 19, 23-27, 29-37, 39 and 40 additional NMR data (2D-NMR, NOE) are available upon request.

* The figures on the NMR spectra depicts an arbitrary enantiomer. All compounds were obtained as racemic mixtures.

General Procedures. ^1H spectra were recorded at 400 MHz, and the ^{13}C NMR at 75 or 100 MHz, in CDCl_3 or C_6D_6 as solvent, and chemical shifts are reported relative to the residual solvent peak. Flash chromatography was performed silicagel 60 (240-400 mesh) using mixtures of hexanes-ethyl acetate as eluent. Reactions requiring anhydrous conditions were carried out under an atmosphere of dry argon. Anhydrous THF was distilled from sodium in a recycling still. Other solvents were purified by standard techniques. HPLC was performed on silicagel columns (10 μm , μ -porasil) 7.8 X 300 mm using mixtures of hexanes-ethyl acetate as eluent with a flowrate of 29 mL/min, using a refraction index detector.

0-96, CDCl₃, 400 MHz, 30-9-99

4

D-70, CDCl₃, 100 MHz, 25-6-99

204.9

ppm

14.8

22.4

25.6

25.7

76.6

77.2

76.9

88.5

97.0

125.3

132.4

4

D-208-1, CDCl₃, 400 MHz, 7-9-2000

D-214, CDCl₃, 75 MHz, 9-10-2000

D-24-1, CDCl₃, 400 MHz, 5-4-99

D-13-HPLC, CDCl₃, 300 MHz, 25-2-99 204.1
201.5

ppm

134.1
133.9

121.5

108.9

88.8
85.677.4
77.0
76.5

57.7

44.1
42.4
31.5
30.5
30.3
28.6
28.2
27.3
25.9
25.7
24.6
23.0
22.5
21.6
20.1
15.8
14.7
13.6
12.5
10.8

D-232, CDCl₃, 400 MHz, 7-2-2001

D-232, CDCl₃, 100 MHz, 7-2-2001

ppm

10

135.4
133.2
128.5
128.0
127.7
127.5
126.6
126.5
123.3
116.2
106.5
95.6
77.3
76.9
76.6
26.9
25.9
22.8
22.3
15.9

D-392, CDCl₃, 400 MHz, 13-2-2003

D-391-1, CDCl₃, 75 MHz, 6-3-2002

D-219, CDCl₃, 400 MHz, 16-01-01

D-219, CDCl₃, 400 MHz, 25-1-2001

12

ppm

33.8
30.7
30.2
25.5
23.1
22.0
14.9

85.5
77.2
76.9
76.6

134.1
124.6
116.6

202.1

ppm

D-71-CR, CDCl₃, 400 MHz, 29-6-99

d-71-bis 5 6 7 1 v tono

D-71-bis, CDCl₃, 400 MHz, 23-11-2000

D-71-bis, CDCl₃, 400 MHz, 23-11-2000

D-71-Bis, CDC13, 400 MHz, 23-11-2000

D-71-bis, CDC13, 400 MHz, 23-11-2000

D-236, CDCl₃, 400 MHz, 8-2-2001

D-236, CDC13, 100 MHz, 2-3-2001

D-451, CDCl₃, 400 MHz, 19-9-2002

D-451, CDCl₃, 100 MHz, 23-9-2002

D-224, CDCl₃, 400 MHz, 25-1-2001

D-224, CDCl₃, 100 MHz, 25-1-2001

D-338, CDCl₃, 400 MHz, 23-1-2002

D-338, CDCl₃, 100 MHz, 23-1-2002

D-249, CDCl₃, 400 MHz, 26-9-2002

D-249, CDCl₃, 400 MHz, 26-9-2002

D-249, CDCl₃, 400 MHz, 26-9-2002

D-249, CDCl₃, 400 MHz, 26-9-2002

D-OL-21, C6D6, 400 MHz, 7-2-2002
T=25 °C

-01-21, C6D6, 400 MHz, 7-2-2002
 $T=50^{\circ}\text{C}$

-OL-21, C6D6, 400 MHz, 7-2-2002
T=75 C

D-OL-21, CDCl₃, 100 MHz, 28-1-2002

(±) 20

D-318-1, CDCl₃, 400 MHz, 25-10-2001

D-318-1, CDCl₃, 100 MHz, 25-10-2001

144.8
141.2
137.8
133.9
129.4
129.1
128.6
127.6
127.2
126.5
122.8
121.8

77.8
77.4
77.1
68.3
64.1
62.3
36.0
30.3
27.1
26.8
18.1
16.0

D-319-1, CDCl₃, 400 MHz, 30-10-2001

D-319-1, CDCl₃, 100 MHz, 2-11-2001

D-335-2, CDCl₃, 400 MHz, 10-10-2001

D-335-2, CDC13, 75 MHz, 5-9-2001

ppm

36.7
29.5
28.9
26.9
26.7
22.7
21.1
20.1
15.0
14.7

62.4
62.6

77.4
77.0
76.6
74.6

141.1
135.4
134.5
129.1
129.0
127.8
126.4
119.0

166.1

179.1

(t) 25

D-OL-16, CDCl₃, 100 MHz, 28-1-2002

ppm

144.1
140.8
139.9
139.4
136.2
129.6
129.1
128.7
128.2
127.8
127.4
127.2
126.8
126.8
121.9

77.8
77.5
77.2
67.8
64.2
62.5
36.0
30.4
27.0
26.5
18.1

D-332-2, CDCl₃, 400 MHz, 17-10-2001

0-335-2, CDCl₃, 75 MHz, 3-9-2001

D-395-2, CDCl₃, 100 MHz, 11-6-2002

D-393-1, CDCl₃, 400 MHz, 12-6-2002

D-393-1, CDCl₃, 75 MHz, 5-6-2002

D-394-1, CDCl₃, 400 MHz, 10-6-2002

D-394-1, CDCl₃, 75 MHz, 6-6-2002

D-396-2, CDCl₃, 400 MHz, 14-6-2002

D-396-2, CDCl₃, 100 MHz, 14-6-2002

D-337-2, CDCl₃, 400 MHz, 24-10-2001, T=330K

D-337-2, CDCl₃, 100 MHz, 24-10-2001, T=330K

D-318-2, CDCl₃, 400 MHz, 24-10-2001

D-319-2, CDCl₃, 400 MHz, 2-11-2001

D-319-2, CDCl₃, 100 MHz, 27-11-2001

(±) 34

D-335-3, CDCl₃, 400 MHz, 24-10-2001, T=330K

D-335-3, CDCl₃, 100 MHz, 17-10-2001

(±) 35

D-356-2, CDCl₃, 400 MHz, 14-3-2002

D-356-2, CDCl₃, 100 MHz, 14-3-2002

ppm

26.2
25.8
23.2
22.5

52.2

68.3

77.8
77.4
77.1

112.0

127.0

127.1

127.3

127.5

128.3

128.4

128.6

128.8

129.2

129.8

134.3

137.5

148.5

ppm

20

40

60

80

100

120

140

160

180

200

D-332-3, CDCl₃, 400 MHz, 17-10-2001

D-332-3, CDCl₃, 100 MHz, 24-10-2001

(±) 37

D-395-2, CDC13, 300 MHz, 11-6-2002

D-393-2, CDCl₃, 400 MHz, 14-6-2002
 $T = 55^\circ\text{C}$

D-393-2, CDCl₃, 100 MHz, 10-6-2002

D-394-3, CDCl₃, 400 MHz, 10-6-2002

D-394-3, CDCl₃, 100 MHz, 12-6-2002

D-396-3, CDC13, 300 MHz, 13-6-2002

D-396-3, CDCl₃, 75 MHz, 13-6-2002

X-ray Structure Determination. X-ray data were collected with use of a Nonius Kappa CCD single crystal diffractometer, using graphite-monochromated MoK α radiation ($\lambda = 0.71070 \text{ \AA}$) to θ max of 28.6° . The structure was solved by direct methods using SIR97.¹ Refinement was performed with SHELXL-97² using full-matrix least squares with anisotropic thermal parameters for all non-H atoms. Most of the hydrogen atoms, including those bonded to C2 and C8a, were found in Fourier difference syntheses maps and the remaining placed and refined at idealized positions. The final refinement converged at $R_1=5.53\%$ and $wR_2= 14.77$ with a goodness of fit of 1.093 for 2673 reflections with $F_o > 4\sigma F_o$ from 2973 unique measured. The largest peak on the final difference map was $0.19 \text{ e/ \AA}^3$.

Crystal Data for 29. C₂₆H₃₁N, mol wt.=357.52, orthorhombic, space group P2₁2₁2₁(no. 19), $a=7.553(1)$, $b=9.066(1)$, $c=31.076(2) \text{ \AA}$, $V=2127.9(4) \text{ \AA}^3$, $Z=4$, $D_c=1.12 \text{ g.cm}^{-3}$, $F(000)= 776$, $\mu(\text{MoK}\alpha)=0.06 \text{ mm}^{-1}$. A single crystal of approximate dimensions $0.35 \times 0.25 \times 0.20 \text{ mm}$ was used for all X-ray measurements. Data reduction and cell refinement were carried out with the programs COLLECT³ and DENZO.⁴ Crystallographic data of **29**, including atomic coordinates, have been deposited with the Cambridge Crystallographic Data Centre. Copies of the data can be obtained free of charge, on application to the Director, CCDC, 12 Union Road, Cambridge CB2 1EZ, UK [Fax: 44-(0)1223-306033] or e-mail: deposit@ccdc.cam.ac.uk

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(2) Sheldrick G.M., SHELXL-97 *Program for the Refinement of Crystal Structures*; University of Göttingen: Göttingen, Germany, **1997**.

(3) Nonius KappaCCD Server Software. Nonius B.V., Delft. The Netherlands, **1998**

(4) Otwinowsky Z., Minor W., HKL Denzo and Scalepack in *Methods in Enzymology, Macromolecular Crystallography Part A*, Carter C.E., Sweet R.M., Eds.: Academic Press; University of Texas, Southwestern Medical Centre at Dallas, **1997**, 276, 307-326.

ORTEP Drawing of the x-ray structure of compound 29. The ellipsoids are drawn at 30% probability.