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SUPPLEMENTARY INFORMATION

Improving conversion and enantioselectivity in hydrogenation by combining different monodentate phosphoramidites; a new combinatorial approach in asymmetric catalysis

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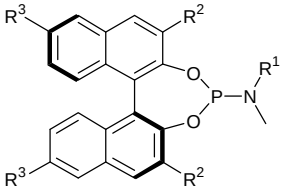
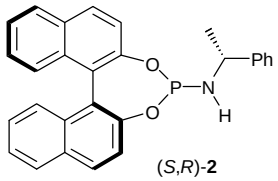
General Procedures.

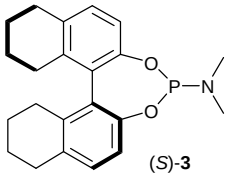
Reagent grade dried solvents were purchased from Fluka and used as received. Enantiomeric excesses were determined by capillary GC analysis with a CP-Chirasil-Dex-CB column (25.0 m x 250 μm x 0.25 μm). Phosphoramidites **1**,[1] **2**,[2] **3**-**5**[3] and **6**[2] were prepared according to published procedures. (*Z*)-**b**-(Acylamino)acrylates **7** and **8** were prepared according to literature procedures.[2]



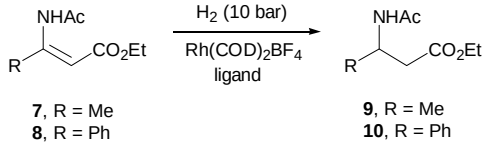
(*S*)-**1**, R^1 = Me, R^2 = R^3 = H
(*S*)-**4**, R^1 = R^2 = Me, R^3 = H
(*S*)-**5**, R^1 = Me, R^2 = H, R^3 = Br
(*S*)-**6**, R^1 = Bn, R^2 = R^3 = H



(*S*,*R*)-**2**



(*S*)-**3**



7, R = Me
8, R = Ph

9, R = Me
10, R = Ph

Procedure for the hydrogenation of (*Z*)-**b**-(acylamino)acrylates 7 and 8.

In a glove box, stock solutions of $Rh(COD)_2BF_4$ (5 mM), ligands **1**-**6** (5 mM) and substrates **7** and **8** (0.5 M) were prepared in DCM. In 88 glass tubes equipped with stirring bars, aliquots of the $Rh(COD)_2BF_4$ solution (200 μL) were added in an automated way by a robot. Then aliquots of the solutions of a single ligand (2 x 200 μL) or a combination of 2 ligands (200 μL each) were added in the corresponding glass tubes. Aliquots of the solutions of substrates **7** or **8** (200 μL) were then added. The resulting mixtures were stirred during 2 hours at 28 °C (DCM evaporation). The suitable solvent (*i*PrOH, DCM, AcOEt or THF) was added (2 mL each) in an automated way. These glass tubes were closed and placed in a 96-vessels autoclave that was purged 5 times with nitrogen and 3 times with hydrogen. Then, the autoclave was pressurized with H_2 to 10 bar and the reactions were stirred at room temperature during16 hours. The resulting mixtures were subjected to conversion and ee determination (capillary GC). The configuration of products were *R* (**9**) and *S* (**10**), determined by comparing the sign of optical rotations with that of the reported ones.[2] Racemic products **9** and **10** were prepared by hydrogenation of **7** and **8** using 10% Pd/C (10%) in MeOH under 1 atm of H_2 for 16 hours.

Supplementary data

entry	*substrate*	*solvent*	*L1*	*L2*	*conv (%)*	*ee (%)*
1	**7**	i-PrOH	**1**	**1**	60	39.4
2	**7**	i-PrOH	**3**	**3**	42	41.7
3	**7**	i-PrOH	**4**	**4**	92	4.3
4	**7**	i-PrOH	**5**	**5**	16	29.2
5	**7**	i-PrOH	**6**	**6**	66	20.6
6	**7**	i-PrOH	**2**	**2**	97	84
7	**7**	i-PrOH	**2**	**1**	88	84.8
8	**7**	i-PrOH	**2**	**3**	85	81.7
9	**7**	i-PrOH	**2**	**4**	99	81
10	**7**	i-PrOH	**2**	**5**	74	84.6
11	**7**	i-PrOH	**2**	**6**	99	87.4
12	**7**	DCM	**1**	**1**	46	68.4
13	**7**	DCM	**3**	**3**	42	60.7
14	**7**	DCM	**4**	**4**	26	54.1
15	**7**	DCM	**5**	**5**	100	79.6
16	**7**	DCM	**6**	**6**	21	60.5
17	**7**	DCM	**2**	**2**	100	79.6
18	**7**	DCM	**2**	**1**	99	86.5
19	**7**	DCM	**2**	**3**	95	85.6
20	**7**	DCM	**2**	**4**	96	91.2
21	**7**	DCM	**2**	**5**	88	85.2
22	**7**	DCM	**2**	**6**	96	82
23	**7**	EtOAc	**1**	**1**	16	17
24	**7**	EtOAc	**3**	**3**	26	25.4
25	**7**	EtOAc	**4**	**4**	4	30.7
26	**7**	EtOAc	**5**	**5**	13	23.8
27	**7**	EtOAc	**6**	**6**	22	28.8
28	**7**	EtOAc	**2**	**2**	79	85.1
29	**7**	EtOAc	**2**	**1**	64	82.3
30	**7**	EtOAc	**2**	**3**	57	76.8
31	**7**	EtOAc	**2**	**4**	62	83.5
32	**7**	EtOAc	**2**	**5**	43	77.1
33	**7**	EtOAc	**2**	**6**	61	85.1
34	**7**	THF	**1**	**1**	23	27.8
35	**7**	THF	**3**	**3**	22	25.1
36	**7**	THF	**4**	**4**	7	19
37	**7**	THF	**5**	**5**	11	20
38	**7**	THF	**6**	**6**	13	49.7
39	**7**	THF	**2**	**2**	68	83.9
40	**7**	THF	**2**	**1**	42	68.7
41	**7**	THF	**2**	**3**	53	67.6
42	**7**	THF	**2**	**4**	57	78.7
43	**7**	THF	**2**	**5**	41	62.3
44	**7**	THF	**2**	**6**	54	83.2
45	**8**	i-PrOH	**1**	**1**	99	52.7
46	**8**	i-PrOH	**3**	**3**	99	63.5
47	**8**	i-PrOH	**4**	**4**	99	24.8
48	**8**	i-PrOH	**5**	**5**	42	52.9

Supplementary data

49	**8**	i-PrOH	**6**	**6**	66	57.9
50	**8**	i-PrOH	**2**	**2**	100	88.6
51	**8**	i-PrOH	**2**	**1**	98	80.1
52	**8**	i-PrOH	**2**	**3**	94	78.7
53	**8**	i-PrOH	**2**	**4**	100	84.5
54	**8**	i-PrOH	**2**	**5**	74	75
55	**8**	i-PrOH	**2**	**6**	99	84.1
56	**8**	DCM	**1**	**1**	83	68.5
57	**8**	DCM	**3**	**3**	75	65.7
58	**8**	DCM	**4**	**4**	43	16.3
59	**8**	DCM	**5**	**5**	49	77.3
60	**8**	DCM	**6**	**6**	35	73
61	**8**	DCM	**2**	**2**	100	69.9
62	**8**	DCM	**2**	**1**	100	82.8
63	**8**	DCM	**2**	**3**	100	83.3
64	**8**	DCM	**2**	**4**	100	90.8
65	**8**	DCM	**2**	**5**	100	82
66	**8**	DCM	**2**	**6**	100	79.3
67	**8**	EtOAc	**1**	**1**	62	31.8
68	**8**	EtOAc	**3**	**3**	49	38.8
69	**8**	EtOAc	**4**	**4**	20	13.1
70	**8**	EtOAc	**5**	**5**	32	45.7
71	**8**	EtOAc	**6**	**6**	25	48.9
72	**8**	EtOAc	**2**	**2**	91	72.8
73	**8**	EtOAc	**2**	**1**	74	62.4
74	**8**	EtOAc	**2**	**3**	67	68.8
75	**8**	EtOAc	**2**	**4**	75	73.2
76	**8**	EtOAc	**2**	**5**	53	66.9
77	**8**	EtOAc	**2**	**6**	67	67.6
78	**8**	THF	**1**	**1**	44	36.8
79	**8**	THF	**3**	**3**	52	45.4
80	**8**	THF	**4**	**4**	12	33.6
81	**8**	THF	**5**	**5**	20	44.5
82	**8**	THF	**6**	**6**	29	67
83	**8**	THF	**2**	**2**	97	85.3
84	**8**	THF	**2**	**1**	86	71.8
85	**8**	THF	**2**	**3**	81	76.4
86	**8**	THF	**2**	**4**	92	84.9
87	**8**	THF	**2**	**5**	67	78
88	**8**	THF	**2**	**6**	83	81.6

Supplementary data

References.
(1) MonoPhos (**1**) was prepared from bis-***b***-naphthol and HMPT with excellent yields: R. Hulst, N. K. de Vries and B. L. Feringa, *Tetrahedron: Asymmetry*, 1994, **5**, 699.
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