Group IV-Metal-Catalyzed Aminolysis of *N*-Acyl-2-oxazolidinones: Applications to the Chemoselective and Enantioselective Carbonylation of Primary Alkylamines

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Reversible acyl transfer reactions catalyzed by enzymes such as lipase in organic solvent have great practical utility, in addition to being of theoretical interest, in asymmetric synthesis due to their facile chiral recognition.[1,2] Such acyl transfer processes are also of practical utility in chemoselective acylation of polyheterofunctional compounds. These enzymatic reactions are recognized to proceed through acyl-enzyme complex 1, the enzyme moiety of which functions as chiral leaving group for achieving such facile selectivities (Figure 1).[2]

The Lewis acid–base complex **2**, derived from *N*-acyl-2-oxazolidinone and a group IV metal catalyst, might be a suitable acyl-donor candidate possessing the similar function to that of the acyl-enzyme complex **1**, since it is known that the complex **2** rigidly exists to provide enhanced electrophilicity of the carbonyl and nice chiral environment with the molecules upon applying chiral Lewis acids or 2-oxazolidinones.[3ab] However, to the best of our knowledge, the complex **2** has never been applied to the selective acylation of heteroatomic nucleophiles as above.[4] In this paper we report our preliminary results on group IV-metal-catalyzed aminolysis of *N*-acyl-2-oxazolidinones and its application to highly chemoselective acylation of straight-chain primary amines as well as enantiodiscrimination between α-phenylethylamine enantiomers.[5]

At first, aminolysis of *N*-benzoyloxazolidin-2-one (**3a**)[6] and its analogs **3b–e**[6] with 2-phenylethylamine was examined under the influence of easily available group IV-metal catalysts **4–7** including titanium or zirconium with a variety of ligands. The results are shown in Table 1. All reactions proceeded in the presence of a catalytic amount of the catalyst in tetrahydrofuran (THF) at room temperature to give the corresponding amides **8** [R = $(CH_2)_2Ph$] in high to modest yields. The rate of aminolysis was found to increase with increasing number of electron-donating η^5-cyclopentadienyl (Cp) groups (entry 2 *vs* 3, Table 1) and with changing the metal from titanium to zirconium (entry 4 *vs* 5, Table 1). Alkoxytitanium catalyst

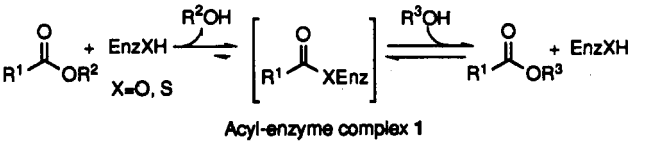


Figure 1. Reversible acyl transfer reactions catalyzed by enzymes.

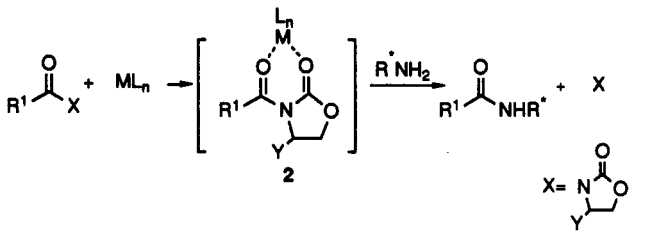
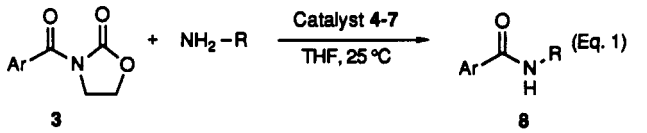


Figure 2. Aminolysis of Lewis acid–base complex **2** derived from *N*-acyl-2-oxazolidinones.

Table 1. Aminolysis of 3 with 2-Phenylethylamine Catalyzed by Group IV-Metal Catalysts 4–7

entry[a]	acyl donor **3**	catalyst	time (h)	yield (%)[b] of **8** [R = $(CH_2)_2Ph$]
1	**3a**	**4**	18	91[c]
2	**3a**	**5**	18	64
3	**3a**	**6**	18	98
4	**3a**	**7**	2	95
5	**3a**	**6**	2	29
6	**3b**	**6**	2	91[d]
7	**3c**	**6**	2	80[e]
8	**3d**	**6**	2	70[f]
9	**3e**	**6**	2	23[g]

[a] All reactions were carried out in THF at 25 °C in the presence of 20 mol % of the catalyst. [b] All compounds gave satisfactory elemental analysis. [c] mp 114–115 °C. [d] mp 163–165 °C. [e] mp 102–104 °C. [f] mp 134–136 °C. [g] mp 127–128 °C.



a: Ar=Ph; **b**: Ar=4-$CF_3C_6H_4$; **c**: Ar=3-ClC_6H_4; **d**: Ar=4-ClC_6H_4; **e**: Ar=4-$MeOC_6H_4$

4: $(i\text{-PrO})_2TiCl_2$; **5**: $CpTiCl_3$; **6**: Cp_2TiCl_2; **7**: Cp_2ZrCl_2

such as $Cl_2Ti(O\textit{i}\text{-Pr})_2$ was also applicable to this reaction (entry 1, Table 1). Moreover, the rate of aminolysis strongly depends on aromatic substituents in acyl-donors **3** and the reactions accelerated with an electron-withdrawing aromatic substituent (entries 6, 7 *vs* 5, 9, Table 1).[7]

In order to explore the generality and scope of the above reaction, the aminolysis of *N*-acyl-2-oxazolidinone derivatives **3** was examined with various structural and functionally diverse primary alkyl- and arylamines (Table 2). It was soon realized that straight-chain primary amines are acylated quite generally to give the corresponding amides **8** in high yields upon treatment with **3a** in the presence of a catalytic amount of Cp_2TiCl_2 at room temperature (entries 1–6, Table 2). Alcohol and acetal functionalities in the molecule did not affect the reactions (entries 4–6). However, the reaction rates for acylations

(1) Recent reviews on enzyme-catalyzed asymmetric synthesis: (a) Zhu, L.-M.; Tedford, M. C. *Tetrahedron* **1990**, *46*, 6587. (b) Xie, Z.-F. *Tetrahedron: Asymmetry* **1992**, *2*, 733. (c) Tamm, C. *Pure Appl. Chem.* **1992**, *64*, 1187.

(2) Chen, C.-S.; Shi, C. J. *Angew. Chem. Int. Ed. Engl.* **1989**, *28*, 695. Klibanov, A. M. *Acc. Chem. Res.* **1990**, *23*, 114. Faber, K.; Liva, S. *Synthesis* **1992**, 895 and refs cited therein.

(3) (a) Evans, D. A.; Chapman, K. T.; Bisaha, J. *J. Am. Chem. Soc.* **1988**, *110*, 1238. (b) Narasaka, K.; Iwasawa, N.; Inoue, M.; Yamada, T.; Nakashima, M.; Sugimori, J. *J. Am. Chem. Soc.* **1989**, *111*, 5340.

(4) Aminolysis of *N*-acetyl-2-oxazolidinones catalyzed by group IV-metal catalysts was briefly reported by Narasaka and co-workers without the detailed scope and limitation.[3b]

(5) During preparation of this manuscript, magnesuim-catalyzed enantioselective alcoholysis of *N*-acyl-2-oxazoldinone was reported: Evans, D. A.; Anderson, J. C.; Taylor, M. K. *Tetrahedron Lett.* **1993**, *34*, 5563.

(6) Tsuge, O.; Itoh, T.; Sakai, K. *Nippon Kagaku Kaishi* **1969**, *90*, 1031.

(7) Linear Hammett plots with a positive ρ value (0.83, $r = 0.97$) for the relative reactivities were obtained.

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Table 2. Titanocene Dichloride (6) and Zirconocene Dichloride (7) Catalyzed Aminolysis of *N*-Acyl-2-oxazolidinones 3a,b with Various Amines

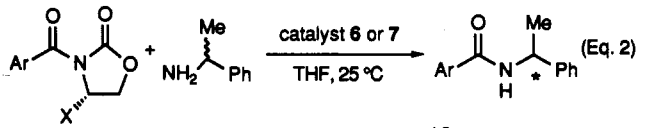
entry[a]	amine (R)	acyl donor 3	catalyst	% yield of 8[b] (mp, °C)
1	CH_2Ph	3a	6	70 (101–103)
2	$(CH_2)_4Me$	3a	6	98 (31–33)
3	CH_2-c-C_6H_{11}	3a	6	86 (104–106)
4	$CH_2CH(OEt)_2$	3a	6	65 (oil)
5	CH_2CH_2OH	3a	6	70 (60–61)
6	$CH_2CHMeOH$	3a	6	80 (88–89)
7	$CHMe_2$	3a	6	18 (99–103)
8	CH(Me)Et	3a	6	10 (75–78)
9	CHMePh	3a	6	0
10	CHMePh	3a	7	30 (122–124)
11	CHMePh	3b	7	98 (152–154)
12	$CHEt_2$	3a	6	0
13	$CHEt_2$	3b	7	75 (122–123)
14	c-C_6H_{11}	3a	6	5[c]
15	3-MeC_6H_4	3a	6	0

[a] All reactions were carried out in THF at 25 °C in the presence of the catalyst (20 mol %) for 18 h. [b] All compounds gave satisfactory elemental analysis. [c] Determined by NMR analysis.

of α-alkyl-branched primary alkylamines and arylamines were found to be substantially slow under the identical conditions and most of starting amines remained unchanged (entries 7–9, 12, 14, and 15, Table 2). Such reactivities of α-alkyl-branched primary alkylamines to the reactions could be improved to give the corresponding amides in modest to high yields upon using **3b** and Cp_2ZrCl_2 as an acyl donor reagent and a mediator, respectively (entries 10, 11, and 13, Table 2).

On the basis of the remarkable reaction rates differences observed above, we next examined the chemoselective carbonylation of straight-chain primary amines in the presence of α-alkyl-branched primary alkylamines and arylamines. Although several useful methods using a variety of reagent systems have been developed for chemoselective acylation of primary amines and alcohols containing secondary amines and alcohols,[8ab] practical and highly selective methods for discriminating sterically and electoronically diverse primary amines with acylation are not available at present.[9,10] Acylation of a 1:1 mixture of benzylamine and 1-phenylethylamine with **3a** in the presence of Cp_2TiCl_2 (20 mol %) in THF proceeded chemoselectively to give *N*-benzylbenzamide (**11**) in 90% yield, while 1-phenylethylamine was recovered in virtually quantitative yield as expected (entry 4, Table 3). 1,2- and 1,3-Diamines were also acylated on N^1 primary amines under the same conditions to give mono-benzamides **9**[11] and **10**[11] in high chemoselectivity (entries 1, 2, and 3, Table 3). In the case of acylation for 1,2-diamine, a small amount of acylation products on N^2 primary amine and both amines were detected; moreover, the selectivity slightly depends upon the molar ratios of the diamine to the acyl donor. The highest selectivity was obtained when a molar ratio of 2:1 of diamine to **3a** was employed (entries 1 and 2, Table 3). Similar high chemoselectivity was observed with the acylation of *p*-aminobenzylamine (entry 5, Table 3).[12]

Finally the present acylation reaction was applied to an enantiodiscrimination between α-phenethylamine enantiomers using chiral *N*-acyl-2-oxazolidinones **14** and **15** as acyl-donor reagents (Table 4).[5] In each of the indicated reactions employing Cp_2ZrCl_2 as a reaction mediator, acylation proceeded with a stereoregular kinetic preference for amidation of the (*R*) amine enantiomer in modest enantioselectivity and good yield (entries 1 and 3, Table 4). On the contrary, the use of Cp_2TiCl_2 induced the reversed enantiopreference for amidation of the (*S*) amine enantiomer.



14: Ar=4-$CF_3C_6H_4$, X=Me_2CH
15: Ar=3-ClC_6H_4, X=$PhCH_2$

16a: Ar=4-$CF_3C_6H_4$
b: Ar=3-ClC_6H_4

In conclusion this study has demonstrated that Lewis acid–base complexes derived from group IV-metal catalysts and *N*-acyl-2-oxazolidinones are mild acylating reagents for highly chemoselective carbonylation of primary amines as well as discrimination of chirality on primary alkylamines.

Experimental Section

General. Melting points are uncorrected. THF was distilled from sodium/benzophenone ketyl prior to use. Unless specified otherwise, reagent-grade amines and group IV metal catalysts were used as received from chemical suppliers. NMR spectra were recorded at 300 or 400 MHz for ^1H and at 100 MHz for ^{13}C in $CDCl_3$ using residual chloroform as an internal reference (7.26 ppm for ^1H and 77.1 ppm for ^{13}C). All reactions were carried out under nitrogen.

General Procedures for the Synthesis of *N*-Acyl-2-oxazoldinones (3, 14, and 15). *N*-Acyl-2-oxazolidinones **3a–e** were prepared by the general method developed by Kunieda.[14] The mixture of 2-oxazolidone and a catalytic amount of 4-(dimethylamino)pyridine (DMAP) in THF was treated with the corresponding acyl chloride (1.0 equiv) at room temperature for 18 h. Usual workup gave **3a–e** in yields of >90%.

3-Benzoyl-2-oxazolidinone (3a): mp 168 °C (lit.[6] mp 168 °C). Anal. Calcd for $C_{10}H_9NO_3$: C, 63.82; H, 4.75; N, 7.33. Found: C, 63.62; H, 4.52; N, 7.41.

3-[4-(Trifluoromethyl)benzoyl]-2-oxazolidinone (3b): mp 176 °C. Anal. Calcd for $C_{11}H_8NO_3F_3$: C, 50.97; H, 3.11; N, 5.41. Found: C, 51.06; H, 2.98; N, 5.38.

3-(3-Chlorobenzoyl)-2-oxazolidinone (3c): mp 171 °C. Anal. Calcd for $C_{10}H_8NO_3Cl$: C, 53.23; H, 3.57; N, 6.21. Found: C, 53.22; H, 3.53; N, 6.16.

3-(4-Chlorobenzoyl)-2-oxazolidinone (3d): mp 163 °C (lit.[6] mp 163 °C). Anal. Calcd for $C_{10}H_8NO_3Cl$: C, 53.23; H, 3.57; N, 6.21. Found: C, 53.32; H, 3.43; N, 6.16

3-(4-Methoxybenzoyl)-2-oxazolidinone (3d): mp 153 °C (lit.[6] mp 153 °C). Anal. Calcd for $C_{10}H_8NO_3Cl$: C, 59.72; H, 5.01; N, 6.35. Found: C, 59.87; H, 4.95; N, 6.35.

(8) (a) Recent examples for chemoselective acylation of primary alcohols: Yamada, S. *J. Org. Chem.* **1992**, *57*, 1592. Ishihara, K.; Kurihara, H.; Yamamoto, H. *J. Org. Chem.* **1993**, *58*, 3791 and refs cited therein. (b) For selective acylation of primary alkylamines in the presence of secondary alkylamines. See Kikugawa, Y.; Mitsui, K.; Sakamoto, T.; Kawase, M.; Tamiya, H. *Tetrahedron Lett.* **1990**, *31*, 243. Akikusa, N.; Mitsui, K.; Sakamoto, T.; Kikugawa, Y. *Synthesis* **1992**, 1058 and refs cited therein.

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(10) Lipase-catalyzed selective acylation of ε-primary amines in the dipeptide of L-Phe-α-L-Lys-*O*-*t*-Bu in organic solvent was reported: Gardossi, L.; Bianchi, D.; Klibanov, A. M. *J. Am. Chem. Soc.* **1991**, *113*, 6328.

(11) Structures of **9** and **10** were proved by their conversion to *N*-(2-hydroxypropyl)benzamide and *N*-(3-hydroxypentyl)benzamide, respectively ($NaNO_2$, AcOH, concd H_2SO_4, 25 °C).

(12) Selective acylation of *p*-aminobenzylamine was recently reported: King, J. F.; Rathore, R.; Lam, J. Y. L.; Guo, Z. R.; Klassen, D. F. *J. Am. Chem. Soc.* **1992**, *114*, 3028.

(13) Pirkle, W. H.; Sikkenga, D. J. *J. Org. Chem.* **1977**, *42*, 1370.

(14) Ishizuka, T.; Kunieda, T. *Tetrahedron Lett.* **1987**, *28*, 4185.

Table 3. Chemoselective Acylation of Straight-Chain Alkylamines in the Presence of α-Alkyl-Branched Primary Amines and Aryl Amines

entry	diamine[b]	acyl donor	catalyst	product	% yield[c] (N^1-monoamide/ N^2-monoamide/diamide)[d]
1[e]	1,2-Diaminopropane	**3a**	**6**	$MeCH(NH_2)CH_2NHCOPh$ (**9**)	83 (85:7:8)
2[e]	1,2-Diaminopropane	**3a**	**7**	**9**	79 (81:9:10)
3	1,3-Diaminopentane	**3a**	**6**	$EtCH(NH_2)CH_2CH_2NHCOPh$ (**10**)	98[f]
4[g]	$PhCH_2NH_2$ + $PhCH(Me)NH_2$	**3a**	**6**	$PhCH_2NHCOPh$ (**11**)	90
				$PhCH(Me)NHCOPh$ (**12**)	2[h]
5	$4\text{-}NH_2C_6H_4CH_2NH_2$	**3a**	**6**	$4\text{-}NH_2C_6H_4CH_2NHCOPh$ (**13**)	95[f]

[a] All reactions were carried out in THF in the presence of the catalyst (20 mol %) at room temperature for 18 h. [b] The molar ratio of diamine to acyl donor is 1.1:1 unless stated otherwise. [c] Yield based on acyl donor. [d] The ratios were determined by ^{1}H-NMR analysis of crude reaction mixtures. [e] The molar ratio of diamine to acyl donor is 2:1. [f] Diamide and the other isomers were not detected by ^{1}H- and ^{13}C-NMR analysis of crude reaction mixture. [g] A 1:1 mixture of amines was used to substrate. [h] 1-Phenylethylamine was recovered in 90% yield.

Table 4. Enantioselective Acylation of α-Phenethylamine with Chiral 2-Oxazolidinones 14 and 15

entry[a]	acyl donor	catalyst	product	% yield[b]	$[\alpha]_D$[c]	% ee[d] (config)[e]
1	**14**	**7**	**16a**	90	+8.07	43 (*R*)
2	**14**	**6**	**16a**	40	−4.37	23 (*S*)
3	**15**	**7**	**16b**	88	+6.94	55 (*R*)

[a] All reactions were carried out in THF at 25 °C in the presence of 20 mol % of the catalyst for 18 h. [b] Yield based on **14** and **15**. [c] Measured in $CHCl_3$ (*c* 1.0) at 20 °C. [d] Determined by NMR analysis with (*R*)-(−)-2,2,2-trifluoro-1-(9-anthryl)ethanol as chiral solvating agent.[13] [e] Determined by comparison with authentic samples prepared from (+)- and (−)-α-phenethylamines.

N-Acyl-2-oxazolidinones **14** and **15** were prepared from the corresponding 2-oxazolidone and acid chloride according to the general protocol (*n*-BuLi, THF, −78 °C) developed by Evans.[3a]

(4*S*)-3-[4-(Trifluoromethyl)benzoyl]-4-(1-methylethyl)-2-oxazolidione (14): mp 132–134 °C; $[\alpha]^{20}_D$ +148.6° (*c* 1.0, $CHCl_3$); ^{1}H NMR ($CDCl_3$) δ 7.74 (2H, d, *J* = 8.5 Hz), 7.70 (2H, d, *J* = 8.5 Hz), 4.73–4.67 (1H, m), 4.43 (1H, dd, *J* = 9.1, 9.1 Hz), 4.39 (1H, dd, *J* = 9.1, 5.2 Hz), 2.45–2.55 (1H, m), 1.0 (6H, d, *J* = 6.9 Hz); MS *m/z* 301 (M^+); IR ($CHCl_3$, cm^{-1}) 1795, 1695. Anal Calcd for $C_{14}H_{14}NO_3F_3$: C, 58.32; H, 5.27; N, 5.23. Found: C, 58.44; H, 5.35; N, 5.27.

(4*S*)-3-(3-Chlorobenzoyl)-4-benzyl-2-oxazolidione (15): mp 97–102 °C; $[\alpha]^{20}_D$ +112.1° (*c* 1.0, $CHCl_3$); ^{1}H NMR ($CDCl_3$) δ 7.62 (1H, broad s), 7.59–7.46 (2H, m), 7.41–7.20 (6H, m), 4.94–4.85 (1H, m), 4.36 (1H, dd, *J* = 9.1, 9.1 Hz), 4.26 (1H, dd, *J* = 9.1, 5.5 Hz), 3.44 (1H, dd, *J* = 13.5, 3.6 Hz), 2.97 (1H, dd, *J* = 13.5, 8.9 Hz); MS *m/z* 315 (M^+); IR ($CHCl_3$, cm^{-1}) 1790, 1690. Anal. Calcd for $C_{17}H_{14}NO_3Cl$: C, 64.66; H, 4.47; N, 4.53. Found: C, 64.71; H, 4.49; N, 4.53.

General Procedure for Group IV-Metal Catalyzed Aminolysis of *N*-Acyl-2-oxazolidinones. To a well-stirred solution of the *N*-acyl-2-oxazolidinones **3**, **14**, or **15** (4 mmol) in 8 mL of THF containing 20 mol % of the metal catalysts **4**, **5**, **6**, or **7** were added the required amines (4.4 mmol) at room temperature. The mixture was stirred for several hours at the same temperature. The reaction was quenched with saturated aqueous $KHSO_4$ and extracted with $CHCl_3$. The organic layer was washed with brine, dried over Na_2SO_4, and evaporated to give the corresponding amides **8**[15] and **16**.

***N*-(1-Phenylethyl)-4-(trifluoromethyl)benzamide (16a)**: mp 152–154 °C; ^{1}H NMR ($CDCl_3$) δ 7.89 (2H, d, *J* = 8.6 Hz), 7.70 (2H, d, *J* = 8.6 Hz), 7.45–7.27 (5H, m), 6.31 (1H, broad s), 5.30–5.40 (1H, m), 1.64 (3H, d, *J* = 7.1 Hz); IR ($CHCl_3$, cm^{-1}) 3500, 1670; MS *m/z* 293 (M^+). Anal. Calcd for $C_{16}H_{14}NOF_3$: C, 65.52; H, 4.81; N, 4.78. Found: C, 65.36; H, 4.83; N, 4.74.

***N*-(1-Phenylethyl)-3-chlorobenzamide (16b)**: mp 88–91 °C; ^{1}H NMR ($CDCl_3$) δ 7.60–7.80 (4H, m), 7.20–7.50 (5H, m), 6.20–6.30 (1H, m), 5.25–5.35 (1H, m), 1.63 (3H, d, *J* = 7.1 Hz); IR ($CHCl_3$, cm^{-1}) 3450, 1665; MS *m/z* 259 (M^+). Anal. Calcd for $C_{15}H_{14}NOCl$: C, 69.36; H, 5.43; N, 5.39. Found: C, 69.14; H, 5.45; N, 5.42.

General Procedure for Monoacylation of Diamines. A mixture of **3** (4 mmol) and a catalyst **6** or **7** (0.8 mmol) in THF (8 mL) was treated with diamines (4–8 mmol) as above. The reactions were quenched with excess water and the mixture was extracted with $CHCl_3$ to give monoamides **9**, **10**, and **13**.[16]

***N*-(2-Aminopropyl)benzamide (9)**: an oil; ^{1}H NMR ($CDCl_3$) δ 7.80 (2H, broad d, *J* = 6.8 Hz), 7.51–7.38 (3H, m), 6.92 (1H, broad s), 3.58–3.45 (1H, m), 3.20–3.10 (2H m), 1.14 (3H, d, *J* = 5.9 Hz); ^{13}C NMR ($CDCl_3$) δ 167.6, 134.7, 131.3, 128.4, 126.9, 47.3, 46.5, 22.1; IR (neat, cm^{-1}) 3300, 1640; HRMS calcd for $C_{10}H_{14}N_2O$ *m/z* 178.1106, found 178.1094.

***N*-(3-Aminopentyl)benzamide (10)**: an oil; ^{13}C NMR ($CDCl_3$) δ 167.0, 134.8, 131.0, 128.3, 126.9, 52.9, 38.8, 34.8, 31.8, 10.2; IR (neat, cm^{-1}) 3300, 1640; HRMS calcd for $C_{12}H_{17}N_2O$ *m/z* 206.1419, found 206.1418.

***N*-(4′-Aminobenzyl)benzamide (13)**: mp 142–143 °C (lit.[16] mp 142–143 °C); ^{1}H NMR ($CDCl_3$) δ 7.77 (2H, d, *J* = 8.3 Hz), 7.51–7.39 (3H, m), 7.16 (2H, d, *J* = 8.1 Hz), 6.68 (2H, d, *J* = 8.1 Hz), 4.53 (2H, d, *J* = 5.3 Hz). MS *m/z* 226 (M^+).

Structural Proof of 9 and 10. Deamination of 9. A solution of amine **9** (4 mmol) in 15 mL of glacial acetic acid was treated with 30 mL of water, five drops of concd H_2SO_4, and a solution of $NaNO_2$ (3 g) in H_2O (3 mL) at 0 °C. The mixture was stirred for 18 h at room temperature and heated at 50 °C for 15 min. The reaction mixture was extracted with ether. The extract was dried (Na_2SO_4) and evaporated to give *N*-(2-hydroxypropyl)-benzamide (mp 88–89 °C, 65% yield), which was identical to the authentic sample prepared by benzoylation of 1-amino-2-propanol.

Deamination of 10. Deamination of **10** as above gave *N*-(3-hydroxypentyl)benzamide in 55% yield, which was identical in all respects with the authentic sample prepared as follows: *N*-(3-hydroxypropyl)benzamide[15c] (895 mg) was oxidized with DMSO (10 mmol), $(COCl)_2$ (5.5 mmol), and Et_3N (25 mmol) at −78 °C in CH_2Cl_2 according to the method of Swern[17] to give an aldehyde which was treated with ethylmagnesium bromide (2 M solution in ether, 3 mL) in THF (10 mL) at 0 °C for 1 h. The reaction was quenched with saturated NH_4Cl and extracted with $CHCl_3$ to give *N*-(3-hydroxypentyl)benzamide in 76% yield as an oil: ^{13}C NMR ($CDCl_3$) δ 168.2, 134.3, 131.4, 128.5, 126.9, 71.3, 37.5, 36.0, 30.2, 10.0.

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