7.13–7.40 (m, 15 H); CIMS m/z 520 $(M + NH_4)^+$. Anal. Calcd for $C_{29}H_{30}N_2O_6$: C, 69.30; H, 6.02; N, 5.58. Found: C, 69.04; H, 5.97; N, 5.50.

Preparation of 4 from 27 and 24. Crude **27** (ca. 193 g, from 0.36 mol of **25**) was dissolved in 6 L of 1,4-dioxane with gentle warming. To this stirred warm solution was added 4 L of H_2O followed by 561 g (1.8 mol) of $Ba(OH)_2 \cdot 8H_2O$. The resulting mixture was heated at reflux for 11 h, after which TLC analysis (93% $CHCl_3$/5% MeOH/2% isopropylamine) showed complete conversion. The reaction mixture was allowed to cool and filtered through paper to remove solid $BaCO_3$. The filtrate was concentrated to remove the dioxane, and the resulting aqueous suspension was extracted with 4 × 500 mL of CH_2Cl_2. The combined CH_2Cl_2 extracts were dried with anhydrous K_2CO_3 (Note: $MgSO_4$ should not be used as drying agent), and the solvent was removed to give 128 g of crude **4** as a tan solid. Recrystallization from 800 mL of ethyl acetate provided 77.7 g (65%) of pure **4** as colorless needles, mp 126.5 °C. A second crop of **4** (2.52 g) was obtained from 200 mL of ethyl acetate, and a third crop (5.1 g) was obtained from 30 mL of ethyl acetate (total yield: 85.3 g (80%). Application of the above procedure to 11.67 g of **24** provided crude **4** which was recrystallized from ethyl acetate to give 5.17 g (74%) of pure **4**. Second and third crops (0.23 g and 0.20 g) were obtained from ethyl acetate/hexane (total yield: 80%): ^1H NMR ($CDCl_3$) δ 2.46 (dd, J = 14, 9 Hz, 1 H), 2.61 (dd, J = 14, 11 Hz, 1 H), 3.02 (td, J = 9, 3 Hz, 1 H), 3.19 (dd, J = 14, 4 Hz, 1 H), 3.35–3.4 (m, 2 H), 3.51 (t, J = 9 Hz, 1 H), 3.76 (dd, J = 9, 3 Hz, 1 H), 7.2–7.4 (m, 10 H); CIMS m/z 301 $(M + H)^+$. Anal. Calcd for $C_{18}H_{24}N_2O_2$: C, 71.97; H, 8.05; N, 9.33. Found: C, 71.79; H, 7.99; N, 9.19.

Preparation of 20 from 24. A solution of 611 mg (1.22 mmol) of **24** in 5 mL of dioxane was treated with 5 mL of 0.5 M aqueous LiOH and stirred at rt for 18 h. After concentration of the resulting solution in vacuo, the residue was partitioned between $CHCl_3$ and water, and the organic layer was dried over Na_2SO_4 and concentrated in vacuo. Flash chromatography using ethyl acetate/$CHCl_3$ mixtures provided 187 mg (43%) of **20**, which had spectral characteristics identical to **20** prepared above from **17**. The structure was confirmed by single-crystal X-ray analysis (Table I).

Preparation of 20 from 27. A solution of 233 mg (0.46 mmol) of **27** in 2 mL of dioxane was treated with 2 mL of 0.5 M aqueous LiOH and stirred at rt for 18 h. After concentration of the resulting solution in vacuo, the residue was partitioned between ethyl acetate and water, and the organic layer was dried over Na_2SO_4 and concentrated in vacuo. Flash chromatography using ethyl acetate/$CHCl_3$ mixtures provided 145 mg of an inseparable mixture. NMR analysis indicated that the major portion of the mixture was identical to **20** prepared by the above methods. CIMS of the mixture showed $(M + NH_4)^+$ at 370 for **20** and 478 for the minor component (relative intensities ca. 2.5:1, respectively).

Acknowledgment. The assistance of the Structural Chemistry Department, Abbott Laboratories, in providing spectra is gratefully acknowledged. We thank Dr. Helen Yip for performing the chiral HPLC analysis of intermediate **25**. This work was supported in part by Public Health Service Grant AI 27220 from the National Institute of Allergy and Infectious Diseases.

Supplementary Material Available: Atomic coordinates for the crystal structures of **19**, **20**, **24**, and **27** (24 pages). This material is contained in many libraries on microfiche, immediately follows this article in the microfilm version of the journal, and can be ordered from the ACS; see any current masthead page for ordering information. Coordinates for the above structures have been deposited in the Cambridge Crystallographic Database.

Base-Promoted Reaction of O-Sulfonylated Hydroxamic Acids with Nucleophiles. A New Method for the Synthesis of α-Substituted Amides

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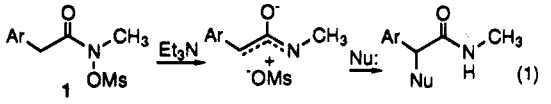
Treatment of a series of hydroxamic acids **2** with mesyl chloride in the presence of 2 equiv of triethylamine at 0 °C gives 2-chloroamides **3** in good yields. Use of a single equivalent of triethylamine gives the *N*-(mesyloxy)amides **1**, which are versatile synthetic intermediates as they can be readily converted to 2-bromoamides **4** with lithium bromide and triethylamine and to 2-hydroxyamides **5** with triethylamine in aqueous acetonitrile.

Introduction

We recently reported that O-sulfonylated N-alkyl hydroxamic acids **1** are readily converted to 2-substituted N-alkyl amides upon treatment with triethylamine and a nucleophile (eq 1).[1] A similar reaction of *N*-(sulfonyloxy)



β-lactams has also been disclosed by Miller.[2] Preliminary data implicate ion pairs, formed by α-proton removal followed by ionization of the sulfonate group from nitrogen, as key intermediates in the reaction. Capture of the ion pair by a nucleophile results in an α-substituted secondary amide (eq 1).[1] This transformation would have great synthetic potential if a wide variety of nucleophiles could be used to trap the ion pair. Herein are presented details of experiments which utilize this chemistry for the efficient preparation of 2-chloro, 2-bromo, and 2-hydroxy amides from *N*-(mesyloxy)-N-alkylamides.

Results and Discussion

The formation of 2-chloroamides was first observed during attempts to prepare O-sulfonylated hydroxamic acids **1** from readily available N-alkylhydroxamic acids **2**.[3] Using a literature procedure,[4] hydroxamic acids **2**, upon

(1) Hoffman, R. V.; Nayyar, N. K.; Klinekole, B. W. *J. Am. Chem. Soc.* **1992**, *114*, 6262.
(2) Gasparski, C. M.; Teng, M.; Miller, M. J., *J. Am. Chem. Soc.* **1992**, *114*, 2741.
(3) (a) Murray, W.; Wachter, M.; Barton, D.; Furero-Kelly, Y. *Synthesis* **1991**, 18. (b) Miller, M. J.; Rajendra, G. *J. Org. Chem.* **1987**, *52*, 4471.

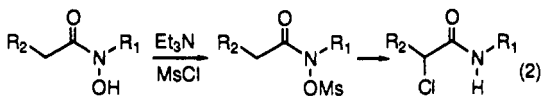
0022-3263/92/1957-5700$03.00/0

Table I. Conversions of O-Sulfonylated Hydroxamic Acids to 2-Substituted Secondary Amides

hydroxamic acid	2		products				
	R_1	R_2	data set 1[a] 3[f] (%)	data set 2[b] 3[f] (%)	data set 3[c] 1[f] (%)	data set 4[d] 4[f] (%)	data set 5[e] 5[f] (%)
2a	CH_3	Ph	72	78[g]	80	89	55
2b	CH_3	3-$CH_3OC_6H_4$	70	68	75	80	
2c	CH_3	4-$CH_3OC_6H_4$	60	59[g]	90	72[i]	
2d	CH_3	3-$CF_3C_6H_4$	67	80	75	60	62
2e	CH_3	4-FC_6H_4	59	76	64	86	60
2f	CH_3	4-ClC_6H_4		80[g]	94	90	78
2g	CH_3	4-BrC_6H_4	58	79[g]	89	92	77
2h	CH_3	1-$C_{10}H_7$	61	79	80	72	81
2i	CH_3	2-thienyl	38		56		59
2j	CH_3	vinyl	32	34	81	44	
2k	c-C_6H_{11}	Ph	45	60[g]	75	97	84
2l	*t*-Bu	Ph	56	79	97	96	78
2m	CH_2Ph	Ph	54	74	98	82	81
2n	CH_2Ph	3-$CH_3OC_6H_4$	58		99		90
2o	CH_2Ph	2-thienyl			56		78
2p	$(CH_2)_2Ph$	Ph		82	92	93	81
2q	$CH(CH_3)$-CH_2Ph	Ph		80[h]	81[h]		91[h]

[a] Yield of 2-chloro amide 3 from reaction of 2 with methanesulfonyl chloride and triethylamine (2.5 equiv). [b] Yield of 2-chloro amide 3 from reaction of 2 with methanesulfonyl chloride and triethylamine (2.5 equiv) and triethylammonium chloride (5 equiv). [c] Yield of *N*-(mesyloxy)amide 1 from reaction of 2 with methanesulfonyl chloride and triethylamine (1.0 equiv). [d] Yield of 2-bromo amide 4 from the reaction of *N*-(mesyloxy)amide 1 with lithium bromide and triethylamine. [e] Yield of 2-hydroxy amide 5 from the reaction of *N*-(mesyloxy)amide 1 with triethylamine and water. [f] Yields are recrystallized yields of analytically pure products. [g] Chloroamides **3a**, **3c**, **3f**, **3g**, and **3k** were also obtained in 79, 56, 81, 80, and 76% yields, respectively, from the reaction of *N*-(mesyloxy)amides **1a**, **1c**, **1f**, **1g**, and **1k** with triethylammonium chloride and triethylamine. [h] As a mixture of diastereomers. [i] Crude yield. This product decomposed on attempted purification.

treatment with methanesulfonyl chloride (1.1 equiv) and triethylamine (2.5 equiv), did not give the sulfonylated hydroxamate 1 as expected. Instead fair to good yields of 2-chloroamides 3 were obtained after purification (eq 2).



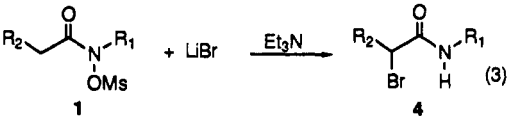
2 R_2= aryl, vinyl; R_1= alkyl — 1 — 3

It was found that a conjugating group, either aryl or vinyl, at C-2 was essential to the success of the reaction; however, a wide variety of aryl substituents and/or N-alkyl groups are tolerated. The results of these experiments are recorded as data set 1 in Table I.

After sufficient data were gathered to support the reaction pathway shown in eq 1,[1] it was evident that trapping of the ion-pair intermediate by chloride was the product-forming step. Furthermore, the only source of chloride in the reaction mixture was the triethylammonium chloride formed as a byproduct in the formation of *N*-(mesyloxy)amide 1 from hydroxamic acid 2 and mesyl chloride. The simple expedient of adding additional triethylammonium chloride (5 equiv) to the reaction mixture gave increased capture efficiency and markedly higher yields of 2-chloro amides 3 in most cases (data set 2, Table I). This constitutes the preferred way to convert hydroxamic acids to 2-chloro amides. In all cases the crude product was obtained in very high yields (>90%) and was of good purity (>95%). The yields of recrystallized, analytically pure material reported in Table I primarily reflect losses during final purification.

The preparation of other 2-substituted amides required that the conversion of hydroxamic acids 2 to mesyloxy amides 1 be carried out first. Then in a subsequent step, they could be converted to the ion pair and captured by an added nucleophile other than chloride. It was determined that the excess base used in the preparation of *N*-(mesyloxy)amides 1 caused their conversion to ion pairs and then 3.[1] This reaction sequence could be interrupted by reacting hydroxamic acids 2 with mesyl chloride and a *single* equivalent of triethylamine. *N*-(Mesyloxy)amides 1 were obtained in high yields as crystalline solids which can be stored indefinitely at 0 °C without decomposition in most cases (data set 3, Table I). Again excellent (>90%) yields of crude products that were of good purity (>95%) were obtained.

Slow addition of triethylamine to a mixture of *N*-(mesyloxy)amides 1 and lithium bromide (10 equiv) in methylene chloride gave the corresponding 2-bromo amides 4 in generally high yields (eq 3). As before, crude yields were



1 — 4

excellent (>90%). The reaction yield was little affected by either aryl or N-alkyl substituents (data set 4, Table I). It was also found that triethylammonium bromide could be used with comparable results. Since triethylammonium bromide is soluble in the reaction mixture whereas lithium bromide is only slightly soluble, the concentration of bromide is not crucial to the success of the reaction so long as there is sufficient bromide present in solution to capture the ion pair as it is formed.

Another transformation of interest is the conversion of *N*-(mesyloxy)amides 1 to 2-hydroxy amides 5. Few methods for the conversion of amides to 2-hydroxy amides are available. Enolates of tertiary amides can be oxidized by several oxidants such as O_2[5] or sulfonyloxaziridines[6] to give α-hydroxy tertiary amides in variable yields, but the reaction appears to be somewhat structure-sensitive.

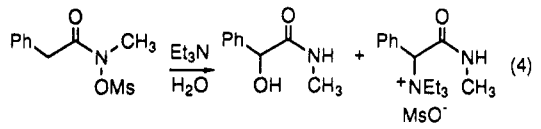
(4) Gassman, P. G.; Granrud, J. E. *J. Am. Chem. Soc.* **1984**, *106*, 1498 and 2448.

(5) (a) Hartwig, W.; Boon, L. *J. Org. Chem.* **1987**, *52*, 4352. (b) Wasserman, H. H.; Lipschutz, B. H. *Tetrahedron Lett.* **1975**, 1731.

(6) Davis, F. A.; Ulatowski, T. A.; Haque, M. S. *J. Org. Chem.* **1987**, *52*, 5288.

These oxidative methods are not applicable to the α-hydroxylation of primary and secondary amides as the enolates are not readily accessible. Thus, only a few reports of the preparation of N-alkyl-2-hydroxy amides are extant. Seebach[7] described the $TiCl_4$-catalyzed reaction between methyl isocyanide and aldehydes to give good yields of *N*-methyl-2-hydroxy amides after hydrolysis. This is a variant of the Passerini reaction.[7] Related modifications include the use of mineral acids[8a] or boron trifluoride[8b] as acid catalysts. Primary 2-hydroxy amides are obtained by the controlled hydrolysis of cyanohydrins.[9] Since 2-hydroxy amides are useful synthetic intermediates for the preparation of ethanolamines,[10] new methods for their preparation are of great interest.

If ion-pair trapping by water could be achieved, a simple synthesis of 2-hydroxy secondary amides could be realized. Accordingly, *N*-(mesyloxy)amide **1a**, dissolved in 50% aqueous acetonitrile, was treated with triethylamine (1.05 equiv), which was added in one portion. Examination of the crude products revealed that 2-hydroxy amide **5a** and 2-triethylammonium amide **6** were produced in nearly a 1:1 ratio (eq 4). Triethylammonium salt **6** had been ob-



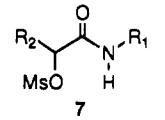
(4)

1a **5a** **6**

tained previously from the reaction of **1** with triethylamine in the absence of added nucleophiles.[1] Apparently, the rate of ion-pair trapping by water to give **5a** is competitive with the rate of ion-pair trapping by triethylamine to give **6**. This difficulty was easily overcome by slow addition (6–12 h) of triethylamine in acetonitrile to the aqueous acetonitrile solution of **1a**. In this way the concentration of free triethylamine was kept very low so its rate of trapping of the ion pair was correspondingly low.[11] The crude product was nearly pure hydroxy amide **5a** which was produced good yield. Recrystallization gave analytically pure **5a** in 55% yield. The same procedure was used to prepare other 2-hydroxy amides **5** in good to excellent yields (data set 5, Table I). As before, the crude products were obtained in high yields (>75%) and high purities (>95%). Recrystallization invariably resulted in lowered yields of analytically pure products.

The above results are noteworthy in several respects. First, they demonstrate that ion-pair intermediates can be generated from O-sulfonylated hydroxamates **1** and trapped with a variety of nucleophiles. This represents a new and effective synthetic methodology for the synthesis of 2-substituted secondary amides. Second, product yields are generally high, as is the purity of the crude products. This indicates that ion-pair formation is a principal reaction of O-sulfonylated hydroxamates with conjugating groups at C-2. Third, the product mixture reflects the rate of trapping of the ion pair intermediate by nucleophiles present in solution.

For example, careful examination of product mixtures from the reaction of hydroxamic acids **2** with triethylamine and methanesulfonyl chloride revealed that, while 2-chloro amides **3** were the major products, 2-(mesyloxy)amides **7**



7

could be detected in yields as high as 5–7%. Some triethylammonium salt **6** was detected as well. These products presumably arise from ion-pair trapping by mesylate and triethylamine, respectively, which are present in solution. As expected, addition of 5 equiv of triethylammonium chloride to the reaction mixture causes the yields of 2-chloroamide **3** to increase and the yields of **7** drop to 1–2%. On the other hand, the greater nucleophilicity of bromide over chloride results in the production of 2-bromoamides **4** accompanied by only trace amounts of **6** and **7**. Fourth, due to the ability of triethylamine to trap the ion pair, the use of non-nucleophilic bases could provide distinct benefits for the generation of ion pairs and consequent attachment of nucleophiles to the 2-position of amides. These aspects are under active investigation.

Experimental Section

Melting points were obtained on a Mel Temp apparatus and are uncorrected. Infrared spectra were taken on a Perkin-Elmer 283 spectrophotometer. Proton NMR spectra were obtained on a Varian XL-200 instrument. ^{13}C NMR spectra were obtained on a Varian Unity-400 instrument. Chemical shifts are reported for chloroform-*d* solution in ppm relative to Me_4Si. Elemental analyses were performed by M-H-W Laboratories, Phoenix, AZ. Thin-layer chromatography was performed on silica gel 60 F254 plates from EM reagents and visualized by UV irradiation/or iodine. Flash column chromatography was performed using silica gel 60 (230–400 mesh).

Synthesis of *N*-Hydroxy-*N*-alkylacetamides 2. General Procedure. To a 0 °C mixture of an N-alkylhydroxylamine hydrochloride (12 mmol) and Et_3N (22 mmol) in CH_2Cl_2 (100 mL) was added a cold solution of the acid chloride (10 mmol) in CH_2Cl_2 (75 mL) over a period of 45–60 min. The mixture was warmed to room temperature and allowed to stir for 1 h. The mixture was diluted with water (100 mL), and the organic layer was washed with 1 N HCl (2 × 25 mL) and brine (2 × 100 mL), dried ($MgSO_4$), and evaporated. The crude product was purified by either crystallization (benzene or hexane–CH_2Cl_2) or flash chromatography (hexane–ethyl acetate (1:9)).

***N*-Hydroxy-*N*-methylphenylacetamide, 2a,** was prepared in 63% yield after crystallization: mp 54–55 °C; ^1H NMR δ 3.11, 3.33 (two s, 3 H, NCH_3), 3.70 (s, 2 H, CH_2), 7.20–7.31 (m, 5 H, ArH), 8.20 (bs, 1 H, OH); ^{13}C NMR δ 36.03, 35.56, 38.53, 38.96, 126.69, 127.34, 128.41, 128.53, 128.91, 129.38, 133.42, 135.02, 165.55, 172.41; IR ($CHCl_3$) 3161, 3032, 2927, 1619, 1495, 1434, 1390, 1192, 1105 cm^{-1}. Anal. Calcd for $C_9H_{11}NO_2$: C, 65.43; H, 6.71; N, 8.47. Found: C, 65.42; H, 6.84; N, 8.56.

***N*-Hydroxy-*N*-methyl-(3-methoxyphenyl)acetamide, 2b,** was prepared in 72% yield after flash chromatography: ^1H NMR δ 3.06, 3.25 (two s, 3 H, NCH_3), 3.57, 3.61 (two s, 2 H, CH_2CO), 3.68 (s, 3 H, OCH_3), 6.71–6.75 (m, 3 H, ArH), 7.12–7.16 (m, 1 H, ArH), 8.4 (bs, 1 H, OH); ^{13}C NMR δ 36.00, 36.94, 38.48, 55.07, 112.08, 112.5, 114.47, 115.22, 120.79, 121.78, 129.33, 129.9, 136.5, 159.57, 172.27; IR (neat) 3164, 2935, 1631, 1259, 1049 cm^{-1}.

***N*-Hydroxy-*N*-methyl(4-methoxyphenyl)acetamide, 2c,** was prepared in 78% yield after flash chromatography: mp 70–71 °C; ^1H NMR δ 3.17, 3.34 (two s, 3 H, NCH_3), 3.64 (s, 2 H, CH_2CO), 3.78 (s, 3 H, OCH_3), 6.86 (d, J = 7.30 Hz, 2 H, ArH), 7.16 (d, J = 8.25 Hz, 2 H, ArH); IR ($CHCl_3$) 3176, 3015, 2933, 2836, 1611, 1512, 1464, 1440, 1391, 1301, 1249, 1215, 1178, 1113, 1035 cm^{-1}. Anal. Calcd for $C_{10}H_{13}NO_3$: C, 61.52; H, 6.71; N, 7.17. Found: C, 61.62; H, 6.67; N, 7.19.

***N*-Hydroxy-*N*-methyl[3-(trifluoromethyl)phenyl]acetamide, 2d,** was prepared in 88% yield after flash chromatography:

(7) Seebach, D.; Schiess, M. *Helv. Chim. Acta* **1983**, *66*, 1618 and references cited therein.

(8) (a) Pascal, R.; Tallides, J.; Commeyras, A. *Tetrahedron* **1978**, *34*, 2275; (b) *Ibid.* **1980**, *36*, 2999.

(9) (a) Jammot, J.; Pascal, R.; Commeyras, A. *Tetrahedron Lett.* **1989**, *30*, 503. (b) Grunewald, G. L.; Brouillertte, W. J.; Finney, J. A. *Tetrahedron Lett.* **1980**, *21*, 1219.

(10) (a) Collin, D. T.; Hartley, D.; Jack, D.; Lunts, L. H. C.; Press, J. C.; Ritchie, A. C. *J. Med. Chem.* **1970**, *13*, 674; (b) *Ibid.* **1963**, *6*, 227.

(11) The trapping reaction by water generates 1 equiv of methanesulfonic acid which produces triethylammonium mesylate. Ion-pair trapping by triethylamine is stoichiometric with respect to triethylamine and does not generate any acid.

mp 72–74 °C; ^{1}H NMR δ 3.11, 3.38 (two s, 3 H, NCH_3), 3.74 (s, 2 H, CH_2CO), 7.37–7.47 (m, 3 H, Ar*H*), 8.76 (bs, 1 H, O*H*); IR ($CHCl_3$) 3177, 2926, 1620, 1492, 1450, 1393, 1333, 1165, 1127, 1076 cm^{-1}. Anal. Calcd for $C_{10}H_{10}F_3NO_2$: C, 51.50; H, 4.32; N, 6.00. Found: C, 51.66; H, 4.55; N, 6.03.

***N*-Hydroxy-*N*-methyl(4-fluorophenyl)acetamide, 2e**, was prepared in 76% yield after flash chromatography: mp 71–72 °C; ^{1}H NMR δ 3.13, 3.35 (two s, 3 H, NCH_3), 3.58, 3.67 (two s, 2 H, CH_2CO), 6.96–7.20 (m, 4 H, Ar*H*), 7.90 (bs, 1 H, O*H*); IR ($CHCl_3$) 3166, 3017, 2923, 1610, 1510, 1437, 1392, 1223, 1108 cm^{-1}. Anal. Calcd for $C_9H_{10}FNO_2$: C, 59.01; H, 5.50; N, 7.64. Found: C, 59.07; H, 5.49; N, 7.65.

***N*-Hydroxy-*N*-methyl(4-chlorophenyl)acetamide, 2f**, was prepared in 84% yield after crystallization: mp 69–70 °C; ^{1}H NMR δ 3.15, 3.35 (two s, 3 H, NCH_3), 3.65, 3.69 (two s, 2 H, CH_2CO), 7.14–7.29 (m, 4 H, Ar*H*), 8.26, 8.54 (two bs, 1 H, O*H*); IR ($CHCl_3$) 3154, 2924, 1614, 1492, 1439, 1392, 1192, 1098 cm^{-1}. Anal. Calcd for $C_9H_{10}ClNO_2$: C, 54.14; H, 5.04; N, 7.01. Found: C, 54.63; H, 5.23; N, 7.13.

***N*-Hydroxy-*N*-methyl(4-bromophenyl)acetamide, 2g**, was prepared in 93% yield after crystallization: mp 81–83 °C; ^{1}H NMR δ 3.12, 3.34 (two s, 3 H, NCH_3), 3.63 (s, 2 H, CH_2CO), 7.07 (d, J = 7.76 Hz, 2 H, Ar*H*), 7.39 (d, J = 8.18 Hz, 2 H, Ar*H*), 8.52 (bs, 1 H, O*H*); IR ($CHCl_3$) 3156, 2926, 1615, 1488, 1437, 1391, 1192, 1113, 1071, 1013 cm^{-1}. Anal. Calcd for $C_9H_{10}BrNO_2$: C, 44.28; H, 4.12; N, 5.73. Found: C, 44.32; H, 4.13; N, 5.72.

***N*-Hydroxy-*N*-methyl(1-naphthyl)acetamide, 2h**, was prepared in 87% yield after crystallization: mp 127–128 °C; ^{1}H NMR δ 3.02, 3.34 (two s, 3 H, NCH_3), 4.01–4.09 (m, 2 H, CH_2CO), 7.26–7.96 (m, 8 H, Ar*H*, O*H*); ^{13}C NMR δ 36.01, 36.03, 123.33, 125.46, 125.99, 126.57, 126.68, 126.70, 128.19, 128.20, 128.85, 133.87, 165.21; IR ($CHCl_3$) 3155, 3050, 2923, 1615, 1391, 1197, 1105 cm^{-1}.

***N*-Hydroxy-*N*-methyl(2-thienyl)acetamide, 2i**, was prepared in 61% yield after crystallization: mp 80–81 °C; ^{1}H NMR δ 3.20, 3.40 (bs, 3 H, NCH_3), 3.88, 3.97 (two s, 2 H, CH_2CO), 6.92 (m, 2 H, Ar*H*), 7.21 (bs, 1 H, Ar*H*), 8.00, 8.50 (two bs, 1 H, O*H*); IR ($CHCl_3$) 3157, 2930, 1621, 1436, 1392, 1206, 1100 cm^{-1}. Anal. Calcd for $C_7H_9NO_2S$: C, 49.10; H, 5.29; N, 8.18. Found: C, 49.34; H, 5.35; N, 8.66.

***N*-Hydroxy-*N*-methyl-3-butenamide, 2j**, was prepared in 54% yield as an oil after flash chromatography: ^{1}H NMR δ 3.18, 3.27 (two s, 3 H, NCH_3), 3.31, 3.58 (two s, 2 H, CH_2CO), 5.24 (m, 2 H, CH_2=CH), 5.93 (m, 1 H, C*H*=CH$_2$), 8.86 (bs, 1 H, O*H*); IR ($CHCl_3$) 3175, 2930, 1618, 1438, 12391, 1197 cm^{-1}. Anal. Calcd for $C_5H_9NO_2$: C, 52.16; H, 7.87; N, 12.16. Found: C, 52.10; H, 7.79; N, 12.14.

***N*-Hydroxy-*N*-cyclohexylphenylacetamide, 2k**, was prepared in 57% yield after crystallization: mp 93–95 °C; ^{1}H NMR δ 1.00–1.81 (m, 10 H, c-C_6H_{11}), 3.53, 3.74 (two s, 3 H, CH_2CO, NC*H*), 7.26–7.36 (m, 5 H, Ar*H*), 8.39 (bs, 1 H, O*H*); ^{13}C NMR δ 24.66, 24.90, 25.45, 29.02, 29.90, 32.78, 38.73, 39.48, 43.83, 48.37, 55.15, 58.66, 126.43, 127.20, 127.31, 128.31, 128.52, 128.80, 128.96, 129.30, 134.20, 134.90, 135.62, 164.24, 164.26, 170.47, 171.82; IR ($CHCl_3$) 3182, 3031, 2933, 2857, 1614, 1496, 1453, 1247, 1166, 1031 cm^{-1}. Anal. Calcd for $C_{14}H_{19}NO_2$: C, 72.07; H, 8.20; N, 6.00. Found: C, 72.28; H, 7.98; N, 6.13.

***N*-Hydroxy-*N*-*tert*-butylphenylacetamide, 2l**, was prepared in 81% yield after flash chromatography: mp 120–121 °C; ^{1}H NMR δ 1.37 (s, 9 H, *t*-Bu), 3.66 (s, 2 H, CH_2CO), 7.14–7.27 (m, 5 H, Ar*H*), 8.22 (bs, 1 H, O*H*); ^{13}C NMR δ 27.41, 27.57, 41.57, 41.76, 41.95, 61.33, 126.36, 126.62, 128.25, 128.50, 129.13, 129.38, 135.50, 173.45; IR ($CHCl_3$) 3188, 3018, 2980, 2933, 1617, 1496, 1455, 1393, 1366, 1291, 1216, 1114, 1076, 1031 cm^{-1}.

***N*-Hydroxy-*N*-benzylphenylacetamide, 2m**, was prepared in 77% yield after crystallization: mp 96–97 °C; ^{1}H NMR δ 3.74–3.77 (bs, 2 H, CH_2CO), 4.78 (s, 2 H), NCH_2), 7.26–7.28 (m, 10 H, Ar*H*), 8.42 (bs, 1 H, O*H*); ^{13}C NMR δ 38.39, 38.92, 52.01, 52.79, 126.57, 126.83, 127.47, 127.72, 128.30, 128.48, 129.29, 129.53, 134.91, 135.87, 172.48; IR ($CHCl_3$) 3174, 3017, 2924, 1614, 1495, 1453, 1352, 1215 cm^{-1}. Anal. Calcd for $C_{15}H_{15}NO_2$: C, 74.66; H, 6.26; N, 5.80. Found: C, 74.69; H, 6.30; N, 5.82.

***N*-Hydroxy-*N*-benzyl-(3-methoxyphenyl)acetamide, 2n**, was prepared in 97% yield after flash chromatography: mp 74–75 °C; ^{1}H NMR δ 3.73 (s, 5 H, OCH_3, CH_2CO), 4.73 (s, 2 H, NCH_2), 6.78 (s, 3 H, Ar*H*) 7.23–7.27 (s, 7 H, Ar*H*, O*H*); ^{13}C NMR δ 38.42, 39.52, 51.97, 52.84, 55.12, 112.36, 112.80, 112.83, 114.34, 114.36, 114.82, 120.97, 121.68, 127.04, 127.67, 128.09, 128.33, 128.51, 128.70, 128.75, 128.79, 129.42, 135.87, 136.43, 159.60, 172.24; IR ($CHCl_3$) 3426, 3308, 3017, 1659, 1519, 1454, 1215 cm^{-1}.

***N*-Hydroxy-*N*-benzyl(2-thienyl)acetamide, 2o**, was prepared in 82% yield after flash chromatography: mp 97–98 °C; ^{1}H NMR δ 3.90–3.99 (s, 2 H, CH_2CO), 4.77–4.84 (s, 2 H, NCH_2), 6.90–6.96 (m, 2 H, Ar*H*), 7.19–7.31 (m, 7 H, Ar*H*, O*H*); ^{13}C NMR δ 32.73, 33.49, 52.08, 53.08, 124.81, 126.69, 127.02, 127.72, 128.24, 128.46, 128.52, 134.52, 135.59, 135.98, 164.50, 171.15; IR ($CHCl_3$) 3405, 3019, 2877, 1626, 1466, 1406 cm^{-1}.

***N*-Hydroxy-*N*-(2-phenylethyl)phenylacetamide, 2p**, was prepared in 96% yield after flash chromatography: mp 89–90 °C; ^{1}H NMR δ 2.91 (dt, J = 6.66, 6.67 Hz, 2 H, CH_2Ph), 3.23 (s, 2 H, CH_2CO), 3.74–3.86 (dt, J = 6.84, 6.42 Hz, 2 H, NCH_2), 7.04–7.32 (m, 10 H, Ar*H*), 8.62 (bs, 1 H, O*H*); ^{13}C NMR δ 32.80, 32.36, 37.95, 39.38, 49.46, 51.09, 126.32, 126.59, 126.90, 127.15, 128.39, 128.45, 128.61, 128.73, 128.96, 129.31, 133.74, 135.08, 137.81, 138.52, 165.06, 172.16; IR ($CHCl_3$) 3166, 3046, 3016, 2917, 1620, 1516, 1471, 1357, 1222, 1087, 1062, 1028 cm^{-1}. Anal. Calcd for $C_{16}H_{17}NO_2$: C, 75.26; H, 6.71; N, 5.48. Found: C, 75.37; H, 6.80; N, 5.50.

***N*-Hydroxy-*N*-(1-phenyl-2-propyl)phenylacetamide, 2q**, was prepared in 83% yield after crystallization: mp 94–95 °C; ^{1}H NMR δ 1.28 (d, J = 6.7 Hz, 3 H, CH_3), 2.73 (m, 2 H, CH_2Ph), 3.14 (s, 2 H, CH_2CO), 4.10 (m, 1 H, NC*H*), 6.93–7.60 (m, 10 H, Ar*H*), 8.58 (bs, 1 H, O*H*); ^{13}C NMR δ 16.64, 18.10, 19.73, 38.05, 39.15, 39.34, 39.58, 41.98, 43.42, 52.95, 57.63, 126.10, 126.33, 126.74, 126.97, 128.14, 128.17, 128.25, 128.42, 128.55, 128.60, 128.70, 129.08, 129.36, 133.76, 135.18, 138.07, 138.53, 165.42, 172.10; IR ($CHCl_3$) 3165, 3064, 3029, 2991, 2934, 1613, 1496, 1454, 1275, 1218, 1168, 1113, 1068, 1031, 1015 cm^{-1}.

Synthesis of N-Alkyl-2-chloro-2-arylethanamides 3. General Procedure. To a solution of the hydroxamic acid **2** (1 mmol) in CH_2Cl_2 (20 mL) and triethylammonium hydrochloride (5 mmol) at 0 °C was added triethylamine (2.5 mmol). The mixture was stirred for 10–12 min, and methanesulfonyl chloride (1.1 mmol) was added dropwise. The solution after being stirred at 0 °C for 30 min was allowed to warm to room temperature and stirred for 6–8 h. The solvent was removed and the residue diluted with ethyl acetate (15 mL), washed with water (4 × 5 mL), 1 N HCl (5 mL), and brine (15 mL) and dried over $MgSO_4$. After rotary evaporation, the product was purified by flash chromatography (hexane–ethyl acetate (6:4)) or crystallization (hexane–CH_2Cl_2). The above procedure, when carried out in the absence of the additional 5 equiv of added triethylammonium hydrochloride, gave lower yields of 2-chloroamides **3** (data set 1 in Table I).

***N*-Methyl-2-chloro-2-phenylethanamide, 3a**, was obtained as a crude solid (840 mg, 89%) which on recrystallization gave a white solid (740 mg, 4.5 mmol, 78%): mp 76–77 °C; ^{1}H NMR δ 2.80 (d, J = 4.8 Hz, 3 H, NCH_3), 5.35 (s, 1 H, C*H*Cl), 7.06 (bs, 1 H, N*H*), 7.31–7.45 (m, 5 H, Ar*H*); ^{13}C NMR δ 26.69, 26.76, 61.16, 61.21, 127.77, 128.77, 137.1, 168.38; IR ($CHCl_3$) 3467, 3314, 3015, 1668, 1534, 1454, 1414, 1215 cm^{-1}. Anal. Calcd for $C_9H_{10}ClNO$: C, 59.00; H, 6.05; N, 7.64. Found: C, 59.46; H, 5.75; N, 7.73.

***N*-Methyl-2-chloro-2-(3-methoxyphenyl)ethanamide, 3b**, was obtained as a crude solid (1.02 g, 75%) which on recrystallization gave a white solid (930 mg, 4.3 mmol, 68%): mp 72–73 °C; ^{1}H NMR δ 2.91 (d, J = 4.9 Hz, 3 H, NCH_3), 3.81 (s, 3 H, OCH_3), 5.34 (s, 1 H, C*H*Cl), 6.68 (bs, 1 H, N*H*), 6.91–6.99 (m, 3 H, Ar*H*), 7.03–7.29 (m, 1 H, Ar*H*); ^{13}C NMR δ 26.77, 55.25, 61.21, 113.55, 114.50, 120.04, 129.81, 138.48, 159.75, 168.23; IR ($CHCl_3$) 3431, 3305, 3010, 2941, 1665, 1600, 1535, 1490, 1455, 1265, 1216, 1161, 1049 cm^{-1}. Anal. Calcd for $C_{10}H_{12}ClNO_2$: C, 56.21; H, 5.66; Cl, 16.59; N, 6.55. Found: C, 55.98; H, 5.82; Cl, 16.59; N, 6.55.

***N*-Methyl-2-chloro-2-(4-methoxyphenyl)ethanamide, 3c**, was obtained as a crude solid (738 mg, 68%) which on recrystallization gave a white solid (630 mg, 3.0 mmol, 59%): mp 96–97 °C; ^{1}H NMR δ 2.9 (d, J = 4.7 Hz, 3 H, NCH_3), 3.8 (s, 3 H, OCH_3), 5.3 (s, 1 H, C*H*Cl), 6.84 (bs, 1 H, N*H*), 6.88 (d, J = 8.8 Hz, 2 H, Ar*H*), 7.34 (d, J = 8.8 Hz, 2 H, Ar*H*); IR ($CHCl_3$) 3332, 2959, 1666, 1613, 1514, 1453, 1406, 1306, 1253, 1208, 1178, 1027 cm^{-1}. Anal. Calcd for $C_{10}H_{12}ClNO_2$: C, 56.21; H, 5.66; Cl, 16.59; N, 6.55. Found: C, 56.25; H, 5.70; Cl, 16.72; N, 6.42.

***N*-Methyl-2-chloro-2-[3-(trifluoromethyl)phenyl]ethanamide, 3d**, was obtained as a crude solid (213 mg, 100%) which

on recrystallization gave a white solid (170 mg, 0.68 mmo., 80%): mp 57–58 °C; ^{1}H NMR δ 2.92 (d, J = 4.87 Hz, 3 H, NCH_3), 5.41 (s, 1 H, CHCl), 6.86 (bs, 1 H, NH), 7.51–7.70 (m, 4 H, ArH); ^{13}C NMR δ 26.92, 60.60, 124.64, 124.68, 124.72, 124.76, 125.84, 125.88, 125.91, 129.41, 131.31, 133.32, 135.44, 138.13, 167.42; IR ($CHCl_3$) 3535, 3302, 3093, 2945, 1663, 1536, 1451, 1414, 1330, 1265, 1169, 1133 cm^{-1}. Anal. Calcd for $C_{10}H_9F_3ClNO$: C, 47.73; H, 3.60; Cl, 14.08; N, 5.56. Found: C, 47.95; H, 3.85; Cl, 13.90; N, 5.50.

***N*-Methyl-2-chloro-2-(4-fluorophenyl)ethanamide, 3e**, was obtained as a crude solid (570 mg, 94%) which on recrystallization gave a white solid (450 mg, 2.2 mmol, 76%): mp 90–91 °C; ^{1}H NMR δ 2.91 (d, J = 4.7 Hz, 3 H, NCH_3), 5.36 (s, 1 H, CHCl), 6.70 (bs, 1 H, NH), 7.01–7.10 (m, 2 H, ArH), 7.38–7.44 (m, 2 H, ArH); ^{13}C NMR δ 26.87, 60.86, 115.73, 115.95, 129.71, 129.79, 133.07, 133.10, 161.67, 164.15, 167.86; IR ($CHCl_3$) 3436, 3320, 3016, 1670, 1605, 1533, 1509, 1415, 1215, 1160 cm^{-1}. Anal. Calcd for C_9H_9ClFNO: C, 53.61; H, 4.49; Cl, 17.58; N, 6.94. Found: C, 53.83; H, 4.62; Cl, 17.47; N, 6.99.

***N*-Methyl-2-chloro-2-(4-chlorophenyl)ethanamide, 3f**, was obtained as a crude solid (1.0 g, 92%) which on recrystallization gave a white solid (880 mg, 4.0 mmol, 80%): mp 106–107 °C; ^{1}H NMR δ 2.89 (d, J = 4.94 Hz, 3 H, NCH_3), 5.34 (s, 1 H, CHCl), 6.86 (bs, 1 H, NH), 7.35 (s, 4 H, ArH); ^{13}C NMR δ 26.87, 60.67, 128.99, 129.21, 135.01, 135.62, 167.7; IR ($CHCl_3$) 3437, 3335, 3018, 1669, 1533, 1492, 1413, 1216, 1092, 1017 cm^{-1}. Anal. Calcd for $C_9H_9Cl_2NO$: C, 49.56; H, 4.15; N, 6.42. Found: C, 49.67; H, 4.31; N, 6.44.

***N*-Methyl-2-chloro-2-(4-bromophenyl)ethanamide, 3g**, was obtained as a crude solid (1.22 g, 91%) which on recrystallization gave a white solid (1.06 g, 4.0 mmol, 79%): mp 121–122 °C; ^{1}H NMR δ 2.90 (d, J = 4.87 Hz, 3 H, NCH_3), 5.33 (s, 1 H, CHCl), 6.83 (bs, 1 H, NH), 7.30 (d, J = 8.5 Hz, 2 H, ArH), 7.51 (d, J = 8.57 Hz, 2 H, ArH); ^{13}C NMR δ 26.88, 60.75, 123.21, 129.47, 131.96, 136.09, 167.57; IR ($CHCl_3$) 3436, 3336, 3017, 1673, 1531, 1488, 1415, 1215, 1074 cm^{-1}. Anal. Calcd for $C_9H_9BrClNO$: C, 41.17; H, 3.45; N, 5.33. Found: C, 41.33; H, 3.59; N, 5.42.

***N*-Methyl-2-chloro-2-(1-naphthyl)ethanamide, 3h**, was obtained as a crude solid (1.1 g, 100%) which on recrystallization gave a white solid (870 mg, 3.7 mmol, 79%): mp 114–115 °C; ^{1}H NMR δ 2.94 (d, J = 4.92 Hz, 3 H, NCH_3), 6.09 (s, 1 H, CHCl), 6.92 (bs, 1 H, NH), 7.41–7.62 (m, 4 H, ArH), 7.85–7.91 (m, 2 H, ArH), 8.08 (d, J = 7.94 Hz, 1 H, ArH); ^{13}C NMR δ 26.78, 26.99, 59.06, 59.43, 123.02, 123.31, 125.18, 126.15, 126.25, 126.63, 126.93, 127.27, 128.92, 129.13, 130.06, 130.27, 132.86, 133.98, 168.30; IR ($CHCl_3$) 3433, 3324, 3063, 1669, 1531, 1413 cm^{-1}. Anal. Calcd for $C_{13}H_{12}ClNO$: C, 66.81; H, 5.17; Cl, 15.17; N, 5.99. Found: C, 66.71; H, 5.23; Cl, 15.12; N, 5.96.

***N*-Methyl-2-chloro-2-(2-thienyl)ethanamide, 3i**, was obtained as a crude solid (840 mg, 89%) which on recrystallization gave a white solid (510 mg, 2.7 mmol, 37%): mp 105–107 °C; ^{1}H NMR δ 2.92 (d, J = 4.9 Hz, 3 H, NCH_3), 5.65 (s, 1 H, CHCl), 6.76 (bs, 1 H, NH), 6.95–6.99 (m, 1 H, ArH), 7.17–7.19 (m, 1 H, ArH), 7.33–7.36 (m, 1 H, ArH); IR ($CHCl_3$) 3500, 3277, 3017, 1654, 1533, 1413, 1331, 1215 cm^{-1}. Anal. Calcd for C_7H_8ClNOS: C, 44.23; H, 4.25; N, 7.38. Found: C, 44.39; H, 4.29; N, 7.32.

2-Chloro-*N*-methyl-3-butenamide, 3j, was obtained as a crude oil (380 mg, 57%) which on recrystallization gave a light yellow solid (215 mg, 1.7 mmol, 33%): mp 32–33 °C; ^{1}H NMR δ 2.88, 2.89 (dd, J = 4.76 and 4.94 Hz, 3 H, NCH_3), 4.85 (d, J = 7.05 Hz, 1 H, CHCl), 5.33–5.59 (m, 2 H, CH_2=CH), 5.96–6.14 (m, 1 H, CH=CH_2), 6.62 (bs, 1 H, NH); ^{13}C NMR δ 26.77, 60.71, 119.64, 133.25, 167.79. IR ($CHCl_3$) 3437, 3310, 3093, 2944, 1659, 1537, 1413, 1210, 1174 cm^{-1}. Anal. Calcd for C_5H_8ClNO: C, 44.95; H, 6.03; N, 10.48. Found: C, 45.05; H, 5.99; N, 10.32.

***N*-Cyclohexyl-2-chloro-2-phenylethanamide, 3k**, was obtained as a crude solid (730 mg, 97%) which on recrystallization gave a white solid (450 mg, 1.8 mmol, 60%): mp 124–125 °C; ^{1}H NMR δ 1.2–1.98 (m, 10 H, c-C_6H_{11}), 3.79 (bs, 1 H, NH), 5.35 (s, 1 H, CHCl), 6.23 (bs, 1 H, NH), 7.26–7.42 (m, 5 H, ArH); ^{13}C NMR δ 24.67, 25.42, 32.84, 48.84, 61.77, 127.73, 128.834, 128.98, 137.36, 166.29; IR ($CHCl_3$) 3299, 2932, 2856, 1651, 1544, 1453, 1351, 1216, 1092 cm^{-1}. Anal. Calcd for $C_{14}H_{18}ClNO$: C, 66.79; H, 7.20; N, 5.56. Found: C, 66.76; H, 7.00; N, 5.59.

***N*-*tert*-Butyl-2-chloro-2-phenylethanamide, 3l**, was obtained as a crude solid (220 mg, 97%) which on recrystallization gave a white solid (180 mg, 0.79 mmol, 79%): mp 127–128 °C (lit.[12] mp 126.5–127.5 °C); ^{1}H NMR δ 1.40 (s, 9 H, t-Bu), 5.26 (s, 1 H, CHCl), 6.59 (bs, 1 H, NH), 7.26–7.44 (m, 5 H, ArH); ^{13}C NMR δ 28.45, 51.89, 61.92, 127.64, 127.72, 128.31, 128.91, 137.53, 11.35; IR ($CHCl_3$) 3019, 1677, 1523, 1216 cm^{-1}. Anal. Calcd for $C_{12}H_{16}ClNO$: C, 63.85; H, 7.14; N, 6.20. Found: C, 63.87; H, 7.06; N, 6.21.

***N*-Benzyl-2-chloro-2-phenylethanamide, 3m**, was obtained as a crude solid (1.25 g, 96%) which on recrystallization gave a white solid (970 mg, 3.7 mmol, 74%): mp 95–96 °C; ^{1}H NMR δ 4.5 (d, J = 5.8 Hz, 2 H, NCH_2), 5.42 (s, 1 H, CHCl), 7.3–7.43 (m, 10 H, ArH); ^{13}C NMR δ 43.91, 61.4, 61.58, 127.48, 127.6, 127.71, 128.67, 128.84, 136.91, 137.35, 167.37; IR ($CHCl_3$) 3421, 3335, 3017, 1673, 1522, 1454, 1215 cm^{-1}. Anal. Calcd for $C_{15}H_{14}ClNO$: C, 69.36; H, 5.43; Cl, 13.64; N, 5.39. Found: C, 69.15; H, 5.56; Cl, 13.81; N, 5.39.

***N*-Benzyl-2-chloro-2-(3-methoxyphenyl)ethanamide, 3n**, was obtained as a crude solid (1.66 g, 70%) which on recrystallization gave a white solid (1.33 g, 4.6 mmol, 58%): mp 69–70 °C; ^{1}H NMR δ 3.78 (s, 3 H, OCH_3), 4.5 (dd, J = 5.72 and 0.64 Hz, 2 H, NCH_2), 5.38 (s, 1 H, CHCl), 6.87–7.04 (m, 4 H, ArH, NH), 7.25–7.39 (m, 6 H, ArH); ^{13}C NMR δ 43.85, 55.19, 55.22, 61.25, 61.3, 113.14, 113.27, 114.73, 114.79, 119.98, 120.09, 127.53, 128.64, 129.77, 129.87, 137.50, 138.3, 159.73, 167.45; IR ($CHCl_3$) 3303, 3028, 2934, 1665, 1601, 1532, 1361, 1176, 1040 cm^{-1}. Anal. Calcd for $C_{16}H_{16}ClNO_2$: C, 66.32; H, 5.56; N, 4.83. Found: C, 66.15; H, 5.66; N, 4.75.

***N*-(2-Phenylethyl)-2-chloro-2-phenylethanamide, 3p**, was obtained as a crude solid (1.17 g, 84%) which on recrystallization gave a white solid (1.15 g, 4.1 mmol, 82%): mp 56–57 °C; ^{1}H NMR δ 2.86 (dt, J = 6.67 and 6.91 Hz, 2 H, CH_2Ph), 3.59 (m, 2 H, NCH_2), 5.33 (s, 1 H, CHCl), 6.67 (bs, 1 H, NH), 7.16–7.40 (m, 10 H, ArH); ^{13}C NMR δ 35.35, 41.14, 61.69, 126.62, 127.71, 128.67, 128.76, 128.82, 128.99, 136.99, 138.34, 167.32; IR ($CHCl_3$) 3300, 3106, 3029, 2957, 1661, 1531, 1497, 1455, 1216, 1031 cm^{-1}. Anal. Calcd for $C_{16}H_{16}ClNO$: C, 70.19; H, 5.89; N, 5.11. Found: C, 70.07; H, 5.81; N, 5.00.

***N*-(1-Phenyl-2-propyl)-2-chloro-2-phenylethanamide, 3q**, was obtained as a crude solid (620 mg, 96%) which on recrystallization gave a white solid (515 mg, 1.76 mmol, 80%): mp 70–71 °C; ^{1}H NMR δ 1.16, 1.23 (dd, J = 6.66 and 6.63 Hz, 3 H, CH_3CH), 2.74–2.85 (m, 2 H, CH_2Ph), 4.24–4.32 (m, 1 H, NCH), 5.29, 5.30 (two s, 1 H, CHCl), 6.58 (bs, 1 H, NH), 7.10–7.41 (m, 10 H, ArH); ^{13}C NMR δ 19.76, 20.32, 42.09, 42.35, 46.90, 47.35, 61.70, 61.77, 126.56, 126.58, 127.70, 128.42, 128.52, 128.61, 128.73, 128.77, 128.83, 128.86, 128.98, 129.30, 129.45, 137.06, 137.13, 137.33, 137.59, 166.44; IR ($CHCl_3$) 3412, 3313, 3065, 3015, 2930, 1664, 1603, 1524, 1497, 1455, 1376, 1217, 1181, 1114, 1093, 1031 cm^{-1}. Anal. Calcd for $C_{17}H_{18}ClNO$: C, 70.88; H, 6.30; N, 4.86. Found: C, 70.68; H, 6.21; N, 4.78.

Preparation of *N*-(Mesyloxy)amides 1. General Procedure. To a solution of the hydroxamic acid **2** (5 mmol) in CH_2Cl_2 (25 mL) at 0 °C was added triethylamine (5 mmol). The mixture was stirred for 10–12 min, and methanesulfonyl chloride (5.5 mmol) was added dropwise. The solution was stirred at 0 °C for 2 h, allowed to warm to room temperature, and stirred for another 2 h. The organic layer was washed with water (2 × 20 mL), 1 N HCl (15 mL), and brine (20 mL) and dried over $MgSO_4$. After rotary evaporation, the product was usually purified by crystallization (hexane–CH_2Cl_2) or flash chromatography (hexane–ethyl acetate (6:4)).

***N*-(Mesyloxy)-*N*-methylphenylacetamide, 1a**, was prepared in 80% yield after recrystallization: mp 70–72 °C; ^{1}H NMR δ 3.15 (s, 3 H, SCH_3), 3.46 (s, 3 H, NCH_3), 3.83 (s, 2 H, CH_2CO), 7.26–7.36 (m, 5 H, ArH); ^{13}C NMR δ 37.67, 39.69, 40.09, 127.38, 128.77, 129.29, 132.90, 173.61; IR ($CHCl_3$) 3033, 2938, 1699, 1375, 1186, 1088 cm^{-1}. Anal. Calcd for $C_{10}H_{13}NO_4S$: C, 49.38; H, 5.38; N, 5.75. Found: C, 49.23; H, 5.42; N, 5.69.

***N*-(Mesyloxy)-*N*-methyl(3-methoxyphenyl)acetamide, 1b**, was prepared in 75% yield after recrystallization: mp 59–60 °C; ^{1}H NMR δ 3.16 (s, 3 H, SCH_3), 3.46 (s, 3 H, NCH_3), 3.80 (s, 5 H, OCH_3, CH_2CO), 6.81–6.85 (m, 3 H, ArH), 7.25 (m, 1 H, ArH); ^{13}C NMR δ 37.56, 39.59, 40.00, 55.15, 112.78, 115.04, 121.60, 129.70,

(12) Lengyel, I.; Sheehan, J. C. *Angew. Chem., Int. Ed. Engl.* **1968**, *7*, 25.

134.45, 159.60, 173.47; IR ($CHCl_3$) 3017, 2937, 2836, 1699, 1599, 1585, 1491, 1373, 1258, 1185, 1048 cm^{-1}.

***N*-(Mesyloxy)-*N*-methyl(4-methoxyphenyl)acetamide, 1c**, was prepared in 90% yield after recrystallization: mp 84–85 °C; ^1H NMR δ 3.16 (s, 3 H, SCH_3), 3.46 (s, 3 H, NCH_3), 3.77 (s, 2 H, CH_2CO), 3.80 (s, 3 H, OCH_3), 6.88 (d, J = 8.57 Hz, 2 H, Ar*H*), 7.17 (d, J = 8.57 Hz, 2 H, ArH); ^{13}C NMR δ 37.64, 39.18, 39.68, 55.23, 114.16, 124.81, 130.37, 158.84, 174.0; IR ($CHCl_3$) 3007, 2938, 2837, 1697, 1612, 1513, 1374, 1299, 1184, 1110 cm^{-1}. Anal. Calcd for $C_{11}H_{15}NO_5S$: C, 48.34; H, 5.53; N, 5.12. Found: C, 48.21; H, 5.51; N, 5.09.

***N*-(Mesyloxy)-*N*-methyl[3-(trifluoromethyl)phenyl]acetamide, 1d**, was prepared in 75% yield after flash chromatography: mp 66–68 °C; ^1H NMR δ 3.22 (s, 3 H, SCH_3), 3.47 (s, 3 H, NCH_3), 3.92 (s, 2 H, CH_2CO), 7.45–7.52 (m, 4 H, Ar*H*); ^{13}C NMR δ 37.81, 39.32, 39.50, 124.21, 124.24, 124.28, 124.32, 126.33, 126.37, 126.44, 129.12, 133.06, 133.07, 134.02, 173.3; IR ($CHCl_3$) 3024, 2941, 1699, 1454, 1376, 1267, 1187, 1126, 1077 cm^{-1}. Anal. Calcd for $C_{11}H_{12}F_3NO_4S$: C, 42.44; H, 3.88; N, 4.49. Found: C, 42.63; H, 4.04; N, 4.57.

***N*-(Mesyloxy)-*N*-methyl(4-fluorophenyl)acetamide, 1e**, was prepared in 90% yield after recrystallization: mp 50–52 °C; ^1H NMR δ 3.20 (s, 3 H, SCH_3), 3.47 (s, 3 H, NCH_3), 3.81 (s, 2 H, CH_2CO), 7.04–7.21 (m, 5 H, Ar*H*); ^{13}C NMR δ 37.79, 39.06, 39.50, 115.50, 115.71, 128.67, 128.70, 131.00, 131.09, 160.88, 163.32, 173.78. Anal. Calcd for $C_{10}H_{12}FNO_4$: C, 45.97; H, 4.62; N, 5.36. Found: C, 46.02; H, 4.53; N, 5.44.

***N*-(Mesyloxy)-*N*-methyl(4-chlorophenyl)acetamide, 1f**, was prepared in 94% yield after flash chromatography: mp 69–70 °C; ^1H NMR δ 3.19 (s, 3 H, SCH_3), 3.46 (s, 3 H, NCH_3), 3.81 (s, 2 H, CH_2CO), 7.18 (d, J = 8.50 Hz, 2 H, Ar*H*), 7.32 (d, J = 8.50 Hz, 2 H, Ar*H*); ^{13}C NMR δ 37.80, 39.21, 39.45, 128.74, 128.83, 130.73, 130.83, 131.45, 133.30, 173.48; IR ($CHCl_3$) 3020, 1713, 1494, 1412, 1312, 1216, 1092 cm^{-1}. Anal. Calcd for $C_{10}H_{12}ClNO_4S$: C, 43.24; H, 4.35; N, 5.04. Found: C, 43.44; H, 4.23; N, 5.08.

***N*-(Mesyloxy)-*N*-methyl(4-bromophenyl)acetamide, 1g**, was prepared in 89% yield after flash chromatography: mp 80–81 °C; ^1H NMR δ 3.19 (s, 3 H, SCH_3), 3.45 (s, 3 H, NCH_3), 3.79 (s, 2 H, CH_2CO), 7.12 (d, J = 7.62 Hz, 2 H, Ar*H*), 7.47 (d, J = 7.61 Hz, 2 H, Ar*H*), ^{13}C NMR δ 37.78, 39.26, 39.42, 121.39, 131.18, 131.77, 173.40; IR ($CHCl_3$) 3034, 2937, 1697, 1489, 1373, 1186, 1071 cm^{-1}. Anal. Calcd for $C_{10}H_{12}BrNO_4S$: C, 37.28; H, 3.75; N, 4.34. Found: C, 37.09; H, 3.88; N, 4.34.

***N*-(Mesyloxy)-*N*-methyl(1-naphthyl)acetamide, 1h**, was prepared in 100% yield after flash chromatography: mp 107–108 °C; ^1H NMR δ 3.15 (s, 3 H, SCH_3), 3.51 (s, 3 H, NCH_3), 4.27 (s, 2 H, CH_2CO), 7.38–7.54 (m, 4 H, Ar*H*), 7.80–7.91 (m, 3 H, Ar*H*); IR ($CHCl_3$) 3019, 1701, 1376, 1217, 1186 cm^{-1}. Anal. Calcd for $C_{14}H_{15}NO_4S$: C, 57.32; H, 5.15; N, 4.78. Found: C, 57.42; H, 5.37; N, 4.73.

***N*-(Mesyloxy)-*N*-methyl(2-thienyl)acetamide, 1i**, was prepared in 56% yield as an oil after flash chromatography: ^1H NMR δ 3.20 (s, 3 H, SCH_3), 3.48 (s, 3 H, NCH_3), 4.05 (s, 2 H, CH_2CO), 6.96–6.99 (m, 2 H, Ar*H*), 7.00–7.27 (m, 1 H, Ar*H*); ^{13}C NMR δ 34.25, 37.60, 39.58, 125.44, 126.91, 127.23, 133.94, 172.63; IR ($CHCl_3$) 3019, 1700, 1376, 1215, 1186 cm^{-1}. Elemental analysis could not be obtained for this compound as it decomposed slowly at room temperature.

***N*-(Mesyloxy)-*N*-methyl-3-butenamide, 1j**, was prepared in 81% yield after flash chromatography: ^1H NMR δ 3.21 (s, 3 H, SCH_3), 3.29 (d, J = 6.66 Hz, 2 H, CH_2CO), 3.46 (s, 3 H, NCH_3), 5.17–5.34 (m, 2 H, CH_2=CH), 5.84–6.08 (m, 1 H, CH=CH_2); ^{13}C NMR δ 37.68, 37.88, 39.47, 119.43, 129.32, 173.84; IR ($CHCl_3$) 3083, 3022, 2940, 1703, 1645, 1371, 1256, 1186, 1121, 1078 cm^{-1}. Elemental analysis was precluded by decomposition of the compound upon storage at room temperature.

***N*-(Mesyloxy)-*N*-cyclohexylphenylacetamide, 1k**, was prepared in 79% yield after flash chromatography: mp 78–79 °C; ^1H NMR δ 1.15–1.84 (m, 10 H, c-C_6H_{11}), 3.32 (s, 3 H, SCH_3), 3.79 (s, 2 H, CH_2CO), 3.90 (m, 1 H, NC*H*), 7.25–7.36 (m, 5 H, Ar*H*); ^{13}C NMR δ 24.85, 25.63, 30.25, 39.24, 41.02, 62.34, 127.39, 128.79, 129.08, 133.17, 171.34; IR ($CHCl_3$) 3020, 2939, 2860, 1681, 1497, 1455, 1375, 1217, 1181 cm^{-1}. Anal. Calcd for $C_{15}H_{21}NO_4S$: C, 57.85; H, 6.79; N, 4.49. Found: C, 58.00; H, 6.60; N, 4.52.

***N*-(Mesyloxy)-*N*-*tert*-butylphenylacetamide, 1l**, was prepared in 97% yield after flash chromatography: mp 48–50 °C; ^1H NMR δ 1.45 (s, 9 H, *t*-Bu), 3.19 (s, 3 H, SCH_3), 3.91 (s, 2 H, CH_2CO), 7.20–7.46 (m, 5 H, Ar*H*); ^{13}C NMR δ 28.20, 37.42, 42.38, 65.43, 127.01, 128.48, 129.65, 133.86, 177.53; IR ($CHCl_3$) 3036, 2957, 1691, 1506, 1466, 1372, 1192, 1082, 1043 cm^{-1}. Anal. Calcd for $C_{13}H_{19}NO_4S$: C, 54.71; H, 6.71; N, 4.90. Found: C, 55.33; H, 6.93; N, 4.92.

***N*-(Mesyloxy)-*N*-benzylphenylacetamide, 1m**, was prepared in 100% yield after flash chromatography; mp 49–50 °C; ^1H NMR δ 3.0 (s, 3 H, SCH_3), 3.84 (s, 2 H, CH_2CO), 5.03 (s, 2 H, NCH_2), 7.28–7.31 (m, 10 H, Ar*H*); ^{13}C NMR δ 37.74, 40.27, 55.31, 127.29, 128.32, 128.33, 128.65, 128.78, 129.39, 132.96, 134.48, 173.97; IR ($CHCl_3$) 3064, 3033, 2935, 1697, 1604, 15186, 1497, 1455, 1413, 1376, 1183, 1081, 1031 cm^{-1}. Anal. Calcd for $C_{16}H_{17}NO_4S$: C, 60.17; H, 5.36; N, 4.38. Found: C, 59.93; H, 5.51; N, 4.34.

***N*-(Mesyloxy)-*N*-benzyl(3-methoxyphenyl)acetamide, 1n**, was prepared in 99% yield after flash chromatography: mp 60–62 °C; ^1H NMR δ 3.0 (s, 3 H, SCH_3), 3.77 (s, 2 H, CH_2CO), 5.03 (s, 2 H, NCH_2), 6.75–6.86 (m, 3 H, Ar*H*), 7.23–7.33 (m, 6 H, Ar*H*); IR ($CHCl_3$) 3020, 2957, 1697, 1601, 1493, 1379, 1262, 1217, 1184, 1051 cm^{-1}. Anal. Calcd for $C_{17}H_{19}NO_5S$: C, 58.43; H, 5.48; N, 4.00. Found: C, 58.50; H, 5.41; N, 4.03.

***N*-(Mesyloxy)-*N*-benzyl(2-thienyl)acetamide, 1o**, was prepared in 50% yield after flash chromatography: mp 77–78 °C; ^1H NMR δ 3.04 (s, 3 H, SCH_3), 4.05 (s, 2 H, CH_2CO), 5.05 (s, 2 H, NCH_2), 6.90–7.00 (m, 2 H, Ar*H*), 7.22–7.36 (m, 6 H, Ar*H*); ^{13}C NMR δ 34.53, 37.78, 55.33, 125.40, 126.85, 127.26, 128.37, 128.39, 128.76, 128.83, 133.86, 134.36, 172.87; IR ($CHCl_3$) 3036, 2927, 1710, 1506, 1456, 1381, 1267, 1197, 1092, 1053 cm^{-1}. Elemental analysis was precluded by decomposition of the compound upon storage at room temperature.

***N*-(Mesyloxy)-*N*-(2-phenylethyl)phenylacetamide, 1p**, was prepared in 92% yield after flash chromatography: mp 63–65 °C; ^1H NMR δ 2.95 (dt, J = 6.74, 6.91 Hz, 2 H, CH_2Ph), 3.11 (s, 3 H, SCH_3), 3.45 (s, 2 H, CH_2CO), 4.08 (dt, J = 6.98, 6.74 Hz, 2 H, NCH_2), 7.07–7.36 (m, 10 H, Ar*H*); ^{13}C NMR δ 32.71, 37.96, 39.93, 53.80, 126.94, 127.31, 128.67, 128.77, 129.11, 129.24, 132.97, 137.43, 172.5; IR ($CHCl_3$) 3065, 3029, 2937, 1697, 1604, 1497, 1455, 1413, 1376, 1329, 1217, 1183, 1080, 1031 cm^{-1}. Anal. Calcd for $C_{17}H_{19}NO_4S$: C, 61.24; H, 5.74; N, 4.20. Found: C, 61.40; H, 5.80; N, 4.07.

***N*-(Mesyloxy)-*N*-(1-phenyl-2-propyl)phenylacetamide, 1q**, was prepared in 81% yield after flash chromatography: mp 92–93 °C; ^1H NMR δ 1.34 (d, J = 6.52 Hz, 3 H, CH_3CH), 2.76 (dd, J = 6.03, 5.89 Hz, 1 H, CH_2Ph), 3.06 (dd, J = 8.57 Hz, 1 H, CH_2Ph), 3.25–3.32 (s, 5 H, SCH_3, CH_2CO), 4.22–4.33 (m, 1 H, NC*H*), 7.00–7.37 (m, 10 H, Ar*H*); ^{13}C NMR δ 18.33, 39.28, 40.19, 40.33, 60.84, 126.99, 127.20, 128.62, 128.74, 129.15, 129.45, 133.09, 137.72, 171.00; IR ($CHCl_3$) 3029, 2936, 2857, 1689, 1606, 1497, 1455, 1372, 1218, 1181, 1031 cm^{-1}. Anal. Calcd for $C_{18}H_{21}NO_4S$: C, 62.22; H. 6.09; N, 4.03. Found: C, 62.32; H, 6.06; N, 4.06.

Preparation of N-Alkyl-2-bromo-2-arylethanamides 4. General Procedure. To a solution of the *N*-(mesyloxy)amide 1 (2 mmol) in CH_2Cl_2 (35 mL) and lithium bromide (20 mmol) at 0 °C was added triethylamine (2.2 mmol) in CH_2Cl_2 (15 mL) over a period of 45 min; the resulting solution was then stirred at room temperature for a period of 4–8 h. The solvent was removed and the residue diluted with ethyl acetate (60 mL), washed with water (4 × 20 mL), 1 N HCl (15 mL), and brine (20 mL), and dried over $MgSO_4$. After rotary evaporation, the product was purified by flash chromatography (hexane–ethyl acetate (6:4)) or crystallization (hexane–CH_2Cl_2).

***N*-Methyl-2-bromo-2-phenylethanamide, 4a**, was obtained as a crude solid (450 mg, 97%) which on recrystallization gave a white solid (417 mg, 1.78 mmol, 89%): mp 99–100 °C; ^1H NMR δ 2.89 (d, J = 4.87 Hz, 3 H, NCH_3), 5.44 (s, 1 H, C*H*Br), 6.73 (bs, 1 H, N*H*), 7.27–7.48 (m, 5 H, Ar*H*); ^{13}C NMR δ 27.18, 51.41, 128.32, 128.93, 129.06, 137.46, 167.70; IR ($CHCl_3$) 3299, 3116, 2937, 1665, 1535, 1415, 1170 cm^{-1}. Anal. Calcd for $C_9H_{10}BrNO$: C, 47.39; H, 4.41; Br, 35.03; N, 6.14. Found: C, 47.42; H, 4.61; Br, 34.89; N, 6.52.

***N*-Methyl-2-bromo-2-(3-methoxyphenyl)ethanamide, 4b**, was obtained as a crude solid (480 mg, 93%) which on recrystallization gave a white solid (415 mg, 1.6 mmol, 80%): mp 95–96 °C; ^1H NMR δ 2.90 (d, J = 4.90 Hz, 3 H, NCH_3), 3.81 (s, 3 H, OCH_3), 5.40 (s, 1 H, C*H*Br), 6.71 (bs, 1 H, N*H*), 6.98–7.28 (m, 4 H, Ar*H*); ^{13}C NMR δ 27.17, 51.16, 55.31, 114.06, 114.62, 120.57,

129.95, 138.73, 159.78, 167.68; IR ($CHCl_3$) 3465, 3365, 1667, 1600, 1491, 1265, 1216, 1053 cm^{-1}. Anal. Calcd for $C_{10}H_{12}BrNO_2$: C, 46.53; H, 4.68; N, 5.42. Found: C, 46.50; H, 4.74; N, 5.42.

***N*-Methyl-2-bromo-2-(4-methoxyphenyl)ethanamide, 4c**, was obtained as a crude solid (820 mg, 72%) which on recrystallization gave a white solid (400 mg, 1.5 mmol, 35%): mp 89–90 °C; ^1H NMR δ 2.90, 2.91 (two d, J = 4.87, 4.83 Hz, 3 H, NCH_3), 3.80 (s, 3 H, OCH_3), 5.37, 5.46 (two s, 1 H, CHBr), 6.82 (bs, 1 H, NH), 6.89 (m, J = 8.88 Hz, 2 H, ArH), 7.35 (m, J = 8.71 Hz, 2 H, ArH); ^{13}C NMR δ 26.83, 27.09, 51.32, 55.33, 61.54, 114.24, 129.21, 129.76, 160.06, 168.10, 168.41; IR ($CHCl_3$) 3301, 3016, 2947, 1657, 1621, 1513, 1464, 1412, 1254, 1178, 1033 cm^{-1}. It was clear from examination of the spectral data that **4c** was decomposing during purification so that the final product was not completely pure. As a result elemental analysis was not obtained.

***N*-Methyl-2-bromo-2-[3-(trifluoromethyl)phenyl]ethanamide, 4d**, was obtained as a crude solid (490 mg, 82%) which on recrystallization gave a white solid (350 mg, 1.2 mmol, 60%): mp 69–70 °C; ^1H NMR δ 2.93 (d, J = 4.98 Hz, 3 H, NCH_3), 5.45 (s, 1 H, CHBr), 6.82 (bs, 1 H, NH), 7.48–7.76 (m, 4 H, ArH); ^{13}C NMR δ 27.27, 49.79; 125.17, 125.21, 125.25, 125.28, 125.81, 125.84, 125.88, 125.91, 129.48, 131.83, 138.54, 167.06; IR ($CHCl_3$) 3445, 3345, 3019, 1666, 1531, 1332, 1216, 1170, 1134, 1079 cm^{-1}. Anal. Calcd for $C_{10}H_9BrF_3NO$: C, 40.57; H, 3.06; H, 4.73. Found: C, 40.72; H, 2.91; N, 4.80.

***N*-Methyl-2-bromo-2-(4-fluorophenyl)ethanamide, 4e**, was obtained as a crude solid (930 mg, 94%) which on recrystallization gave a white solid (850 mg, 3.4 mmol, 87%): mp 118–119 °C; ^1H NMR δ 2.91 (d, J = 4.87 Hz, 3 H, NCH_3), 5.42 (s, 1 H, CHBr), 6.76 (bs, 1 H, NH), 7.00–7.46 (m, 4 H, ArH); ^{13}C NMR δ 27.20, 50.27, 115.79, 116.01, 130.26, 130.34, 133.45, 161.60, 164.08, 167.60; IR ($CHCl_3$) 3020, 1696, 1541, 1426, 1216 cm^{-1}. Anal. Calcd for C_9H_9BrNO: C, 43.93; H, 3.69; N, 5.69. Found: C, 43.79; H, 3.80; N, 5.81.

***N*-Methyl-2-bromo-2-(4-chlorophenyl)ethanamide, 4f**, was obtained as a crude solid (1.06 g, 94%) which on recrystallization gave a white solid (1.03 g, 3.9 mmol, 91%): mp 119–120 °C; ^1H NMR δ 2.91 (d, J = 4.94 Hz, 3 H, NCH_3), 5.40 (s, 1 H, CHBr), 6.75 (bs, 1 H, NH), 7.35–7.38 (m, 4 H, ArH); ^{13}C NMR δ 27.24, 50.23, 129.10, 129.74, 135.02, 136.03, 167.29; IR ($CHCl_3$) 3296, 3019, 2927, 2857, 1676, 1592, 1526, 1489, 1462, 1407, 1375, 1349, 1306, 1216, 1172, 1107, 1038 cm^{-1}. Anal. Calcd for $C_9H_9BrClNO$: C, 41.17; H, 3.45; N, 5.33. Found: C, 41.17; H, 3.56; N, 5.38.

***N*-Methyl-2-bromo-2-(4-bromophenyl)ethanamide, 4g**, was obtained as a crude solid (1.24 g, 100%) which on recrystallization gave a white solid (1.15 g, 3.6 mmol, 92%): mp 134–135 °C; ^1H NMR δ 2.91 (d, J = 4.83 Hz, 3 H, NCH_3), 5.38 (s, 1 H, CHBr), 6.74 (bs, 1 H, NH), 7.31 (d, J = 8.50 Hz, 2 H, ArH), 7.49 (d, J = 9.57 Hz, 2 H, ArH); ^{13}C NMR δ 27.21, 50.11, 123.72, 130.00, 132.03, 136.50, 167.29; IR ($CHCl_3$) 3429, 3018, 1674, 1522, 1488, 1416, 1215 cm^{-1}. Anal. Calcd for $C_9H_9Br_2NO$: C, 35.21, H, 2.95; N, 4.56; Br, 52.05. Found: C, 35.45; H, 2.79; N, 4.64; Br, 51.94.

***N*-Methyl-2-bromo-2-(1-naphthyl)ethanamide, 4h**, was obtained as a crude solid (556 mg, 100%) which on recrystallization gave a white solid (419 mg, 1.4 mmol, 72%): mp 162–163 °C; ^1H NMR δ 2.93 (d, J = 4.83 Hz, 3 H, NCH_3), 6.17 (s, 1 H, CHBr), 6.86 (bs, 1 H, NH), 7.44–7.64 (m, 4 H, ArH), 7.85–7.91 (m, 2 H, ArH), 8.06 (d, J = 8.32 Hz, 1 H, ArH); ^{13}C NMR δ 27.39, 49.52, 123.20, 125.38, 126.26, 126.82, 126.88, 128.99, 129.02, 130.21, 133.10, 134.05, 167.79; IR ($CHCl_3$) 3248, 3020, 1670, 1527, 1411, 1216, 1181 cm^{-1}. Anal. Calcd for $C_{13}H_{12}BrNO$: C, 56.14; H, 4.35; N, 5.04. Found: C, 55.97; H, 4.44; N, 4.83.

***N*-Methyl-2-bromo-3-butenamide, 4j**, was obtained as a crude solid (500 mg, 65%) which on recrystallization gave a white solid (335 mg, 1.8 mmol, 44%): ^1H NMR δ 2.87, 2.88 (two d, J = 4.80, 4.86 Hz, 3 H, NCH_3), 4.05 (d, J = 8.07 Hz, 2 H, CH_2Br), 4.87 (d, J = 8.50 Hz, 2 H, CHBr), 5.28–5.48 (m, 2 H, CH_2=CH), 6.02–6.04 (m, 1 H, CH=CH_2), 6.52 (bs, 1 H, NH), 6.86–7.02 (m, 1 H, CH=CH), 7.39–7.48 (m, 1 H, CH=CH); ^{13}C NMR δ 26.45, 26.97, 29.89, 49.65, 120.02, 127.08, 133.85, 137.40, 165.71, 168.07; IR (KBr) 3285, 3096, 3008, 1668, 1627, 1563, 1413, 1349, 1286, 1245, 1203, 1162 cm^{-1}. Elemental analysis was precluded by decomposition of the compound upon storage at room temperature.

***N*-Cyclohexyl-2-bromo-2-phenylethanamide, 4k**, was obtained as a crude solid (592 mg, 100%) which on recrystallization gave a white solid (578 mg, 1.9 mmol, 97%): mp 133–134 °C; ^1H NMR δ 1.20–1.98 (m, 10 H, c-C_6H_{11}), 3.82 (m, 1 H, NCH), 5.42 (s, 1 H, CHBr), 6.60 (bs, 1 H, NH), 7.33–7.44 (m, 5 H, ArH); ^{13}C NMR δ 24.63, 25.40, 32.56, 32.71, 49.13, 51.69, 128.23, 128.88, 137.69, 165.94; IR ($CHCl_3$) 3435, 3305, 3046, 2937, 2887, 1681, 1536, 1476, 1216, 1112, 1057 cm^{-1}. Anal. Calcd for $C_{14}H_{18}BrNO$: C, 56.76; H, 6.12; N, 4.72. Found: C, 56.82; H, 6.50; N, 4.80.

***N*-*tert*-Butyl-2-bromo-2-phenylethanamide, 4l**, was obtained as a crude solid (540 mg, 100%) which on recrystallization gave a white solid (520 mg, 1.9 mmol, 96%): mp 135–136 °C; ^1H NMR δ 1.40 (s, 9 H, *t*-Bu), 5.34 (s, 1 H, CHBr), 6.59 bs, 1 H, NH), 7.33–7.42 (m, 5 H, ArH);^{13}C NMR δ 28.40, 52.03, 52.10, 128.23, 128.88, 128.91, 137.87, 165.98; IR ($CHCl_3$) 3404, 3018, 2971, 1672, 1521, 1455, 1395, 1367, 1284, 1216, 1032 cm^{-1}. Anal. Calcd for $C_{12}H_{16}BrNO$: C, 53.34; H, 5.96; N, 5.18. Found: C, 53.37; H, 5.92; N, 5.16.

***N*-Benzyl-2-bromo-2-phenylethanamide, 4m**, was obtained as a crude solid (560 mg, 91%) which on recrystallization gave a white solid (500 mg, 1.6 mmol, 82%): mp 96–97 °C; ^1H NMR δ 4.51 (d, J = 5.72 Hz, 2 H, NCH_2), 5.48 (s, 1 H, CHBr), 6.92 (bs, 1 H, NH), 7.23–7.48 (m, 10 H, ArH); ^{13}C NMR δ 44.23, 51.05, 127.60, 127.63, 128.33, 128.61, 128.72, 128.80, 128.86, 128.92, 129.03, 137.21, 137.39, 167.26; IR ($CHCl_3$) 3410, 3293, 3066, 3032, 2929, 1657, 1526, 1497, 1455, 1430, 1361, 1313, 1235, 1170, 1030 cm^{-1}. Anal. Calcd for $C_{15}H_{14}NOBr$: C, 59.22; H, 4.63; Br, 26.26; N, 4.60. Found: C, 59.44; H, 4.72; Br, 26.12; N, 4.49.

***N*-(2-Phenylethyl)-2-bromo-2-phenylethanamide, 4p**, was obtained as a crude solid (640 mg, 100%) which on recrystallization gave a white solid (600 mg, 1.8 mmol, 93%); mp 72–73 °C; ^1H NMR δ 2.85 (dt, J = 6.91, 6.74 Hz, 2 H, CH_2Ph), 3.58 (dd, J = 6.27, 6.35 Hz, 2 H, NCH_2), 5.38 (s, 1 H, CHBr), 6.69 (bs, 1 H, NH), 7.16–7.33 (m, 10 H, ArH); ^{13}C NMR δ 35.30, 41.47, 51.48, 126.63, 128.26, 128.68, 128.78, 128.89, 129.00, 137.30, 138.32, 166.96; IR ($CHCl_3$) 3316, 3016, 2927, 1664, 1525, 1455, 1376, 1216, 1087, 1038 cm^{-1}. Anal. Calcd for $C_{16}H_{16}BrNO$: C, 60.39; H, 5.06; N, 4.40. Found: C, 60.50; H, 5.19; N, 4.42.

Preparation of N-Alkyl-2-hydroxy-2-arylethanamides 5. General Procedure. To a solution of the *N*-(mesyloxy)amide 1 (2 mmol) in CH_3CNH_2O (12 mL each) was added triethylamine (2.1 mmol) in 24 mL of CH_3CN over a period of 6–12 h. The mixture was stirred overnight. The solvent was removed and the residue diluted with ethyl acetate (60 mL), washed with water (4 × 20 mL), 1 N HCl (15 mL), and brine (20 mL) and dried over $MgSO_4$. After rotary evaporation, the product was usually purified by recrystallization (benzene).

***N*-Methyl-2-hydroxy-2-phenylethanamide, 5a**, was obtained as a crude solid (260 mg, 78%) which on recrystallization gave a white solid (185 mg, 1.1 mmol, 55%): mp 93–94 °C (lit.[7] mp 94–95 °C); ^1H NMR δ 2.76 (d, J = 4.92 Hz, 3 H, NCH_3), 4.07 (d, J = 3.77 Hz, 1 H, OH, exchangeable with D_2O), 4.96 (d, J = 2.17 Hz, 1 H, CHOH), 6.39 (bs, 1 H, NH), 7.3–7.42 (bs 5 H, ArH), IR ($CHCl_3$) 3423, 3017, 1665, 1539, 1214, 1060 cm^{-1}.

***N*-Methyl-2-hydroxy-2-[3-(trifluoromethyl)phenyl]ethanamide, 5d**, was obtained as a crude solid (820 mg, 85%) which on recrystallization gave a white solid (600 mg, 2.5 mmol, 62%): mp 56–57 °C; ^1H NMR δ 2.72 (d, J = 4.91 Hz, 3 H, NCH_3), 4.91 (d, J = 4.13 Hz, 1 H, OH, exchangeable with D_2O), 5.00 (d, J = 4.37 Hz, 1 H, CHOH), 6.90 (bs, 1 H, NH), 7.40–7.65 (m, 4 H, ArH); ^{13}C NMR δ 25.97, 73.34, 123.23, 123.27, 123.31, 123.35, 124.99, 125.03, 125.06, 125.10, 128.95, 130.06, 140.61, 172.62; IR ($CHCl_3$) 3435, 3020, 1681, 1546, 1421, 1342, 1216, 1137, 1087 cm^{-1}. Anal. Calcd for $C_{10}H_{10}F_3NO_2$: C, 51.50; H, 4.32; N, 6.00. Found: C, 51.60; H, 4.57; N, 6.09.

***N*-Methyl-2-hydroxy-2-(4-fluorophenyl)ethanamide, 5e**, was obtained as a crude solid (298 mg, 81%) which on recrystallization gave a white solid (225 mg, 1.2 mmol, 61%): mp 102–103 °C; ^1H NMR δ 2.82 (d, J = 4.83 Hz, 3 H, NCH_3), 4.34 (bs, 1 H, OH, exchangeable with D_2O), 5.00 (s, 1 H, CHOH), 5.68 (bs, 1 H, NH), 7.01–7.41 (m, 4 H, ArH). Anal. Calcd for $C_9H_{10}FNO_2$: C, 59.01; H, 5.50; N, 7.64. Found: C, 59.44; H, 5.71; N, 7.73.

***N*-Methyl-2-hydroxy-2-(4-chlorophenyl)ethanamide, 5f**, was obtained as a crude solid (350 mg, 87%) which on recrystallization gave a white solid (316 mg, 1.5 mmol, 78%): mp 141–142 °C; ^1H NMR δ 2.83 (d, J = 5.00 Hz, 3 H, NCH_3), 3.68 (bs, 1 H, OH, exchangeable with D_2O), 5.02 (d, J = 2.54 Hz, 1 H, CHOH), 6.22 (bs, 1 H, NH), 7.34 (s, 4 H, ArH). Anal. Calcd for

$C_9H_{10}ClNO_2$: C, 54.14; H, 5.04; N, 7.01. Found: C, 54.02; H, 5.23; N, 7.09.

***N*-Methyl-2-hydroxy-2-(4-bromophenyl)ethanamide, 5g**, was obtained as a crude solid (900 mg, 92%) which on recrystallization gave a white solid (755 mg, 3.08 mmol, 77%): mp 152–153 °C (lit.[7] mp 152–152.5 °C); ^{1}H NMR δ 2.83 (d, J = 5.00 Hz, 3 H, NCH_3), 3.60 (bs, 1 H, OH, exchangeable with D_2O), 5.01 (s, 1 H, CHOH), 6.12 (bs, 1 H, NH), 7.29 (d, J = 8.39 Hz, 2 H, ArH), 7.51 (d, J = 8.64 Hz, 2 H, ArH); IR ($CHCl_3$) 3324, 3019, 1646, 1540, 1404, 1318, 1215 cm^{-1}.

***N*-Methyl-2-hydroxy-2-(1-naphthyl)ethanamide, 5h**, was obtained as a crude solid (800 mg, 93%) which on recrystallization gave a white solid (700 mg, 3.24 mmol, 81%): mp 49–50 °C; ^{1}H NMR δ 2.74 (d, J = 4.83 Hz, 3 H, NCH_3), 4.06 (d, J = 2.85 Hz, 1 H, OH, exchangeable with D_2O), 5.52 (d, J = 2.78 Hz, 1 H, CHOH), 6.03 (bs, 1 H, NH), 7.43–7.54 (m, 4 H, ArH), 7.83–7.90 (m, 2 H, ArH), 8.07–8.18 (m, 1 H, ArH); ^{13}C NMR δ 26.20, 72.53, 123.87, 125.18, 125.94, 126.49, 126.61, 128.75, 129.40, 134.08, 134.76, 173.34; IR ($CHCl_3$) 3410, 3050, 3014, 2943, 1651, 1598, 1540, 1414, 1355, 1216, 1168, 1099, 1054, 1021 cm^{-1}. Anal. Calcd for $C_{13}H_{13}NO_2$: C, 72.53; H, 6.08; N, 6.50. Found: C, 72.48; H, 6.15; N, 6.48.

***N*-Methyl-2-hydroxy-2-(2-thienyl)ethanamide, 5i**, was obtained as a crude solid (350 mg, 60%) which on recrystallization gave a white solid (325 mg, 1.9 mmol, 56%): mp 97–99 °C; ^{1}H NMR δ 2.64 (d, J = 5.35 Hz, 3 H, NCH_3), 5.11 (bs, 1 H, CHOH), 5.26 (bs, 1 H, OH, exchangeable with D_2O), 6.81–6.86 (m, 1 H, ArH), 6.93–6.95 (m, 2 H, ArH, NH), 7.13–7.16 (m, 1 H, ArH); IR ($CHCl_3$) 3418, 3017, 1660, 1541, 1413, 1215, 1077 cm^{-1}. Anal. Calcd for $C_7H_9NO_2S$: C, 49.10; H, 5.29; N, 8.18. Found: C, 49.03; H, 5.48; N, 8.54.

***N*-Cyclohexyl-2-hydroxy-2-phenylethanamide, 5k**, was obtained as a crude solid (450 mg, 96%) which on recrystallization gave a white solid (390 mg 1.68 mmol, 84%): mp 92–93 °C; ^{1}H NMR δ 1.09–1.86 (m, 10 H, c-C_6H_{11}), 3.64 (d, J = 3.73 Hz, 1 H, OH, exchangeable with D_2O), 4.98 (d, J = 3.31 Hz, 1 H, CHOH), 5.96 (bs, 1 H, NH), 7.36–7.41 (m, 5 H, ArH); ^{13}C NMR δ 24.68, 23.59, 37.24, 48.14, 73.95, 126.76, 128.27, 128.58, 139.85, 171.49; IR ($CHCl_3$) 3410, 3019, 2936, 2857, 1662, 1526, 1453, 1216, 1060 cm^{-1}. Anal. Calcd for $C_{14}H_{19}NO_2$: C, 72.07; H, 8.20; N, 6.00. Found: C, 72.29, H, 8.26; N, 5.95.

***N*-*tert*-Butyl-2-hydroxy-2-phenylethanamide, 5l**, was obtained as a crude solid (410 mg, 99%) which on recrystallization gave a white solid (334 mg, 1.6 mmol, 80%): mp 120–121 °C; ^{1}H NMR δ 1.32 (s, 9 H, t-Bu), 3.67 (d, J = 3.63 Hz, 1 H, OH, exchangeable with D_2O), 4.90 (d, J = 3.42 Hz, 1 H, CHOH), 6.81 (bs, 1 H, NH), 7.37 (s, 5 H, ArH); ^{13}C NMR δ 28.60, 51.25, 74.04, 74.15, 126.76, 128.30, 128.66, 139.96, 171.53; IR ($CHCl_3$) 3415, 3020, 1676, 1525, 1476, 1396, 1216, 1067, 1033 cm^{-1}. Anal. Calcd for $C_{12}H_{17}NO_2$: C, 69.53; H, 8.26; N, 6.75. Found: C, 69.41; H, 8.43; N, 6.82.

***N*-Benzyl-2-hydroxy-2-phenylethanamide, 5m**, was obtained as a crude solid (860 mg, 95%) which on recrystallization gave a white solid (740 mg, 2.99 mmol, 81%): mp 96–97 °C; ^{1}H NMR δ 3.6–3.65 (bs, 1 H, OH, exchangeable with D_2O), 4.43, 4.44 (dd, J = 5.78 Hz, NCH_2), 5.07 (d, J = 3.49 Hz, 1 H, CHOH), 6.52 (bs, 1 H, NH), 7.16–7.43 (m, 10 H, ArH); ^{13}C NMR δ 43.06, 43.14, 73.93, 74.0, 126.59, 127.44, 127.48, 128.33, 128.55, 128.59, 137.63, 139.52, 172.54; IR ($CHCl_3$) 3416, 3018, 1668, 1526, 1454, 1215 cm^{-1}. Anal. Calcd for $C_{15}H_{15}NO_2$: C, 74.66; H, 6.26; N, 5.8. Found: C, 74.87; H, 6.27; N, 5.86.

***N*-Benzyl-2-hydroxy-2-(3-methoxyphenyl)ethanamide, 5n**, was obtained as a crude solid (540 mg, 100%) which on recrystallization gave a white solid (490 mg, 1.8 mmol, 90%): mp 58–59 °C; ^{1}H NMR δ 3.61 (d, J = 3.17 Hz, 1 H, OH, exchangeable with D_2O), 3.79 (s, 3 H, OCH_3), 4.45 (dd, J = 5.08, 5.50 Hz, 2 H, NCH_2), 5.05 (d, J = 3.31 Hz, 1 H, CHOH), 6.40 (bs, 1 H, NH), 6.85–7.01 (m, 3 H, ArH), 7.19–7.32 (m, 6 H, ArH); ^{13}C NMR δ 43.29, 55.18, 74.00, 111.98, 114.28, 119.06, 127.49, 127.52, 128.64, 129.74, 137.71, 141.00, 159.80, 172.26; IR ($CHCl_3$) 3399, 3335, 3012, 2927, 1657, 1601, 1531, 1490, 1455, 1262, 1157, 1047 cm^{-1}. Anal. Calcd for $C_{16}H_{17}NO_3$: C, 70.83; H, 6.31; N, 5.16. Found: C, 70.90; H, 6.38; N, 5.12.

***N*-Benzyl-2-hydroxy-2-(2-thienyl)ethanamide, 5o**, was obtained as a crude solid (870 mg, 100%) which on recrystallization gave a white solid (680 mg, 2.73 mmol, 78%): mp 90–91 °C; ^{1}H NMR δ 3.99 (d, J = 3.98 Hz, 1 H, OH, exchangeable with D_2O), 4.43 (d, J = 5.96 Hz, 2 H, NCH_2), 5.32 (d, J = 3.57 Hz, 1 H, CHOH), 6.73 (bs, 1 H, NH), 6.94–6.98 (m, 1 H, ArH), 7.08–7.10 (m, 1 H, ArH), 7.18–7.32 (m, 1 H, ArH); ^{13}C NMR δ 43.45, 70.14, 125.95, 126.00, 126.86, 127.60, 127.61, 128.70, 137.48, 142.41, 142.43, 171.32; IR ($CHCl_3$) 3403, 3315, 3018, 1664, 1531, 1476, 1372, 1216, 1082 cm^{-1}. Anal. Calcd for $C_{13}H_{13}NO_2S$: C, 63.05; H, 5.29; N, 5.65. Found: C, 63.18; H, 5.34; N, 5.71.

***N*-(2-Phenylethyl)-2-hydroxy-2-phenylethanamide, 5p**, was obtained as a crude solid (500 mg, 97%) which on recrystallization gave a white solid (415 mg, 1.62 mmol, 81%): mp 96–97 °C; ^{1}H NMR δ 2.85 (m, 2 H, CH_2Ph), 3.43–3.61 (m, 1 H, NH), 3.63 (d, J = 3.35 Hz, 1 H, OH, exchangeable with D_2O), 4.96 (d, J = 3.11 Hz, 1 H, CHOH), 6.03 (bs, 1 H, NH), 7.00–7.42 (m, 10 H, ArH); ^{13}C NMR δ 35.47, 40.53, 73.99, 126.47, 126.70, 128.41, 128.56, 128.68, 138.44, 139.48, 172.32; IR ($CHCl_3$) 3402, 3066, 3017, 2934, 1657, 1603, 1496, 1455, 1366, 1335, 1217, 1194, 1082, 1062, 1029 cm^{-1}. Anal. Calcd for $C_{16}H_{17}NO_2$: C, 75.26; H, 6.71; N, 5.48. Found: C, 75.25; H, 6.60; N, 5.36.

***N*-(1-Phenyl-2-propyl)-2-hydroxy-2-phenylethanamide, 5q**, was obtained as a crude solid (1.28 g, 100%) which on recrystallization gave a white solid (1.16 g, 4.32 mmol, 91%): mp 105–107 °C; ^{1}H NMR δ 1.09, 1.11 (two d, J = 6.70, 8.22 Hz, 3 H, CH_3), 2.68 (d, J = 6.6 Hz, 2 H, CH_2Ph), 2.75 (d, J = 6.67 Hz, 2 H, CH_2Ph), 3.38, 381 (dd, J = 3.17 and 3.49 Hz, 1 H, OH, exchangeable with D_2O), 4.20–4.31 (m, 1 H, NCH), 4.92 (d, J = 3.49 Hz, 1 H, CHOH), 5.74, 6.10 (two bs, 1 H, NH), 6.87–7.41 (m, 10 H, ArH); ^{13}C NMR δ 19.82, 20.08, 42.14, 42.32, 46.09, 46.19, 73.84, 74.19, 126.40, 126.43, 126.77, 126.79, 128.34, 128.44, 128.62, 128.77, 129.34, 137.31, 139.56, 171.45; IR ($CHCl_3$) 3390, 3063, 3029, 2972, 2928, 1652, 1532, 1453, 1219, 1143, 1092, 1062, 1030 cm^{-1}. Anal. Calcd for $C_{17}H_{19}NO_2$: C, 75.80; H, 7.11; N, 5.20. Found: C, 75.64; H, 7.20; N, 5.20.

***N*-Methyl-2-(triethylammonio)-2-phenylethanamide Mesylate, 6.** A solution of **1a** (300 mg, 1.23 mmol) in CH_2Cl_2 (6.5 mL) was treated with triethylamine (0.19 mL, 1.35 mmol), and the mixture was stirred at room temperature for 1 h. The organic layer was washed with water (5.0 mL), and the aqueous layer, after rotary evaporation, gave a semisolid which was recrystallized to furnish a quantitative yield of **6**. The crude product (semisolid, 423 mg, 100%) was recrystallized (hexane–CH_2Cl_2) to give a white solid (360 mg, 85%): mp 134–136 °C; ^{1}H NMR δ 1.33 (dt, J = 6.99 and 7.3 Hz, 9 H, CH_2CH_3), 2.76 (d, J = 4.66 Hz, 3 H, NCH_3), 2.81 (s, 3 H, SCH_3), 3.67–3.88 (m, 6 H, NCH_2), 6.05 (s, 1 H, NCH), 7.42–7.50 (bs, 3 H, ArH), 7.95–7.99 (bs, 2 H, ArH), 9.16 (bs, 1 H, NH); ^{13}C NMR δ 9.50, 26.28, 39.53, 53.92, 72.05, 128.16, 129.16, 131.04, 132.27, 166.29; IR ($CHCl_3$) 3249, 3068, 2988, 1676, 1537, 1457, 1414, 1190, 1042 cm^{-1}. Anal. Calcd for $C_{16}H_{28}N_2O_4S$: C, 55.78; H, 8.19; N, 8.13; S, 9.30. Found: C, 56.0; H, 8.02; N, 8.32; S, 9.41.

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Supplementary Material Available: NMR spectra of **1b**, **1i**, **1j**, **2b**, **2h**, **2l**, **2n**, **2o**, **2q**, and **4j** (10 pages). This material is contained in many libraries on microfiche, immediately follows this article in the microfilm version of the journal, and can be ordered from the ACS; see any current masthead page for ordering instructions.