A New Route to *N*-Aryl 2-Alkenamides, *N*-Allyl *N*-Aryl 2-Alkenamides, and *N*-Aryl α,β-Unsaturated γ-Lactams from *N*-Aryl 3-(Phenylsulfonyl)propanamides

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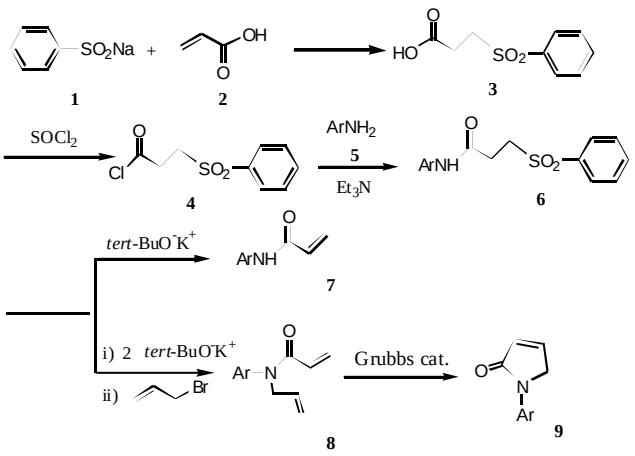
A series of *N*-aryl 2-alkenamides were produced efficiently by treating *N*-aryl 3-(phenylsulfonyl)-propanamides with potassium *tert*-butoxide in THF at 0 °C. Without isolation, it was further treated with an additional equivalent of potassium *tert*-butoxide and allyl bromide to give *N*-allyl *N*-aryl 2-alkenamides in one pot in good yields. Followed by a ring-closing metathesis reaction, these *N*-allyl *N*-aryl 2-alkenamides were respectively converted into corresponding *N*-aryl α,β-unsaturated γ-lactams in moderate yields.

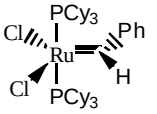
INTRODUCTION

2-Alkenamides or acrylamides, useful monomers for polyacrylamides, have been known to chemists for a long time. In addition, they are widely used as Michael acceptors for several nucleophiles such as organolithums,[1] piperazine,[2] anion of malonate,[3] thiourea,[4] etc.[5] It also played as a starting material for producing 1-aza-2-cyano-1,3-butadiene, a key intermediate to give azacyclohexenes,[6] and also can be converted to a chiral dienophiles for Diels-Alder reaction.[7] Furthermore, in recent reports *N*-substituted 2-alkenamides having *N*-allyl function, play an important role to certain γ-lactams *via* radical cyclization[8] and for α,β-unsaturated γ-lactams by ring-closing metathesis reaction with Grubbs catalyst.[9] The present industrial preparation for acrylamides, which circumvents the highly unstable and toxic acryloyl chloride as key starting material,[10] adopts the two-step method. This strategy involves the Michael addition and amidation of acrylic ester with 2 equivalents of amine and followed by deamination to give the desired compound at 180-300 °C.[11] Other methodologies included the use of hydroxyl group,[12] chloride,[13] bromide,[14] amine,[15] etc. as leaving group for the preparation of *N*-substituted acrylamides *via* 1,2-elimination. Their drawbacks include low yield, long reaction time, harsh reaction condition, and the reagent's corrosive, volatile, and toxic nature. Despite the availability of many synthetic methods, there still exists a need to develop more efficient and less toxic procedures than those currently in existence. To the best of our knowledge, all previous reports for *N*-aryl alkenamides have paid no attention to the use of phenylsulfonyl group as leaving group. Herein we wish to report a new, simple, efficient and less toxic method to prepare *N*-aryl alkenamides by debenzenesulfonation of 3-(phenylsulfonyl)propanamides with one equivalent of potassium *tert*-butoxide (Scheme I). On the other hand *N*-allyl *N*-aryl alkenamides, an important building block for some γ-lactams, prepared formerly from a corresponding amine and toxic acryloyl chloride, were disadvantageous.

Scheme I



a. Ar = C_6H_5 c. Ar = 4-$CH_3OC_6H_5$ e. Ar = 4-ClC_6H_5
b. Ar = 4-$CH_3C_6H_5$ d. Ar = 4-FC_6H_5 f. Ar= 4-BrC_6H_5

Grubbs catalyst = 

In this reported process, it can be prepared in one pot by treating *N*-aryl 3-(phenylsulfonyl)propanamide with two equivalents of *tert*-butoxide and 1 equivalent of allyl bromide to undergo debenzenesulfonation and followed by allylation. This method led a new route to *N*-allyl *N*-aryl alkenamides and circumvented the use of the toxic and volatile starting material, acryloyl chloride. Furthermore the ring-closure metathesis (RCM) of *N*-allyl *N*-aryl alkenamides with Grubbs catalyst[16a] was achieved to give a series of *N*-aryl α,β-unsaturated γ-lactams, a key intermediate for mitomycin.[17] Meanwhile the physical data, such as ^{1}H-NMR, ^{13}C-NMR, and EI-MS of some new *N*-aryl α,β-unsaturated γ-lactams are described.

RESULTS AND DISCUSSION

3-(Phenylsulfonyl)propanoic acid (**3**), purchased from Aldrich Co. or prepared from sodium benzenesulfinate (**1**), and acrylic acid (**2**), as general method in 65% yields, was treated with excess thionyl chloride under reflux to give 3-(phenylsulfonyl)propanoyl chloride (**4**). After removing excess thionyl chloride, and without further purification, it was allowed to react with corresponding primary amines in the presence of an hydrous triethylamine to afford *N*-aryl 3-(phenylsulfonyl)propanamides (**5a-f**) in high yields. When compound **5** was reacted with potassium *tert*-butoxide at 0 °C in THF, no cyclization or dimerization, but high yield of elimination products **6** was observed. But the reaction of **5** with potassium *tert*-butoxide was carried out at room temperature in THF, gave a lower yield of **6** together with its dimer. For instance, in the case of compound **5b,** its dimer was given in 10% yields, and showed two singlet methyl signals at δ 2.30 and 2.37; and three doublet doublet olefinic protons at δ 5.54, 6.01, and 6.37 in ^{1}H-NMR spectrum. By our method running at 0 °C in THF, it gave *N*-phenylacrylamide (**7a**) in 90% yield, *N*-(4-methylphenyl)acrylamide (**7b**) in 95% yield, *N*-(4-methoxyphenyl) acrylamide (**7c**) in 96% yield, *N*-(4-fluorophenyl)acrylamide (**7d**) in 90% yield, *N*-(4-chlorophenyl)acrylamide (**7e**) in 93% yield, and *N*-(4-bromophenyl)acrylamide (**7f**) in 96% yield. Their structures are coincident with the previous reports by comparing with MP, EI-MS and NMR spectra data if available. Furthermore these acrylamides, without isolation or purification, can be extended to the one-pot method for the preparation of *N*-allyl *N*-aryl acrylamides (**8a-f**) in good yields by reacting it with an additional equivalent of potassium *tert*-butoxide and allyl bromide. Their structures were elucidated by spectral data such as NMR, EI-MS, and HRMS. For instance, in the case of **8c**, the ^{1}H-NMR (400 MHz, $CDCl_3$) spectrum showed a three-proton singlet signal at 3.83 ppm indicating the presence of one methoxyl group; a two-proton doublet triplet at 4.34 ppm corresponding to the methylene of the allyl group in the structure. In addition, a three one-proton doublet doublet at 5.51 ppm (J = 2.0 Hz, and 10.4 Hz), 6.04 ppm (J = 10.4 Hz, and 16.8 Hz), and 6.36 ppm (J = 2.0, and 16.8 Hz) were indicated, respectively, to the three vinyl protons by *gem-cis*, *cis-trans*, and *gem-trans* coupling. Furthermore the three olefinic protons of the allyl group were shown, respectively, at 5.07 ppm (d, J = 1.2 Hz, 1H), 5.11-5.14 ppm (m, 1H), and 5.83-5.93 ppm (m, 1H). The remaining two two-proton aromatic multiplet signals were indicated, respectively, at 6.89-6.92 ppm, and 7.05-7.09 ppm. The EI-MS spectrum showed the molecular ion at *m/z* 217, corresponding to the molecular formula $C_{13}H_{15}NO_2$. The high-resolution mass of **8c**, $C_{13}H_{15}NO_2$ found for 217.1103, matched with the calculated one. These results proved the correctness of the structure of **8c**. **8a-f** was a colorless liquid, and difficult to purify by distillation because part of it was polymerized during the process of vacuum distillation. Its purification was subjected to chromatographic silica-gel column using ethyl acetate/*n*-hexane (1/5) as eluent. Our one-pot method has successfully afforded a new and efficient route to prepare *N*-allyl *N*-aryl acrylamides, and successfully circumvented the use of toxic and volatile starting material, acryloyl chloride. Furthermore cyclization of *N*-allyl *N*-aryl acrylamides (**8a-f**) to *N*-aryl α,β-unsaturated γ-lactams (**9a-f**) was accomplished by oleifin ring-closure metathesis in the presence of Grubbs catalyst. As in the general procedure described by Grubbs et al., **8a-f** were cyclized, respectively, to give **9a-f** within 20 hours in 50-65% yields in anhydrous dichloromethane, even prolonging the reaction time to 2-3 days. Recently Furstner, A. et al.,[16b] using modified Grubbs catalyst to cyclize **8a** in anhydrous toluene at 80 °C to give **9a** in 82% yield was reported. Under the same conditions, in our case using Grubbs catalyst to cyclize **8a** in anhydrous toluene at 80 °C gave **9a** in 55% yields which almost gave the same yield to compare with the reaction running in dried dichloromethane at room temperature. But the decrease of the reaction time from 2 days to 3 hours was observed. The structure of **9a-f** was elucidated by their physical data such as ^{1}H-NMR, ^{13}C-NMR, HETCOR, and HRMS. In the ^{1}H-NMR spectrum (400 MHz, $CDCl_3$), a typical pattern was found in this series of compounds. The case of **9d** showed a two-proton triplet at 4.34 ppm (J = 2.0 Hz) corresponding to H-5, and two one-proton doublet triplet (J = 6.0 Hz, J = 2.0 Hz) at 6.19 and 7.10 ppm indicating the presence of olefin protons, H-3 and H-4, respectively. The ^{13}C-NMR spectrum (100 MHz, $CDCl_3$) of **9d** showed one

sp^3-carbon at 53.42 ppm corresponding to C-5, two olefinic carbons at 129.11 ppm and 142.17 ppm, respectively, indicating C-3 and C-4, four aromatic carbon at 115.69 (J = 21.3 Hz), 120.70 (J = 9.1 Hz), 135.17 (J = 0 Hz), and 159.31 (J = 242.7 Hz) respectively indicating C'-3, C'-2, C'-1, and C'-4, and one carbonyl carbon at 168.98 ppm. Furthermore besides the molecular ion, some characteristic fragments such as [m^+-29], [m^+-55], and [m^+-82] in the EI/MS spectra were commonly found in **9a-f**. The detailed studies about the fragmental behaviors of *N*-aryl α,β-unsaturated γ-lactam in EI/MS will be reported elsewhere. The application of acrylamides to synthesize some other interesting heterocyclic compounds now is currently in progress.

EXPERIMENTAL

Melting points (Yanaco micro melting-point apparatus) are uncorrected. ^{1}H-NMR and ^{13}C-NMR spectra were obtained on a Varian Gemini-200 or Varian Unity Plus 400 spectrometer. Chemical shifts are measured in parts per million with respect to TMS. Elemental analyses were recorded on a Heraeus CHN-O Rapid analyzer. Mass spectra were recorded on Chem/hp/middle instrument, and HRMS were recorded on JEOL, JMSD-200 or on JEOL, JMS-SX. Silica gel (230-400 mesh) for column chromatography, and precoated silica gel plates (60F-254) for TLC were purchased from E. Merck. UV light (254 nm) was used to detect spots on TLC plates after development.

General procedure for the preparation of *N*-aryl 3-(phenylsulfonyl)propanamide (6a-f)

3-(phenylsulfonyl)propanoic acid (**4a-f**) (5 mmol), prepared from sodium benzenesulfinate and acrylic acid, or purchased from Aldrich Co., was reacted with excess thionyl chloride (20 mmol) under reflux for 12 hr. Then the reaction mixture was concentrated under reduced pressure to remove excess thionyl chloride to afford 3-(phenylsulfonyl) propanoyl chloride (**5a-f**). Without further purification, it (**5a-f**) was dissolved in anhydrous dichloromethane (100 mL), and cooled with ice bath. To this cooled solution, it was added dropwise with the corresponding amine (**3a-f**) (5 mmol), and followed with triethylamine (5.5 mmol). The mixture was stirred at 0 °C for 2 h, and then it was washed with 2% HCl (10 mL × 2), and with brine (10 mL × 2). Finally the organic layer was dried with anhydrous magnesium sulfate, and filtered. The filtrate was concentrated under a reduced pressure to give crude *N*-aryl 3-(phenylsulfonyl)propanamide (**6a-f**) which was purified by silica gel chromatographic column (*n*-hexane/ethyl acetate = 1/1). The results obtained are shown as follows:

N-Phenyl-3-(phenylsulfonyl)propanamide (6a)

Pure (**6a**) (1.37 g, 95%) was obtained as colorless crystals; mp 116-117 °C (EtOAc + *n*-hexane); R_f = 0.56 (EtOAc : *n*-hexane = 1 : 1); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 2.93 (t, J = 8.0 Hz, 2H, $SO_2CH_2C\underline{H}_2$), 3.57 (t, J = 8.0 Hz, 2H, $SO_2C\underline{H}_2CH_2$), 7.08 (t, J = 7.6 Hz, 1H, Ar-H), 7.26 (t, J = 8.0 Hz, 2H, Ar-H), 7.43 (t, J = 8.0 Hz, 2H, Ar-H), 7.56 (t, J = 7.6 Hz, 2H, Ar-H), 7.66 (m, 1H, Ar-H), 7.94 (d, J = 7.6 Hz, 2H, Ar-H), 8.04 (br s, 1H, NH); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 29.80 (CH_2), 51.89 (CH_2), 119.87, 124.48, 127.96 128.92, 129.47, 134.10, 137.55, 138.63 (Ar-C), 167.01 (C=O); MS (EI, 70 eV), *m/z* 289 (M^+, 54.30), 197 (7.26), 148 (2.95), 125 (41.02), 93 (100), 77 (19.07), 55 (34.67). *Anal. Calcd* for $C_{15}H_{15}NO_3S$: C, 62.26; H, 5.23; N, 4.84. Found: C, 62.20; H, 5.28; N, 4.71.

N-(4-Methylphenyl)-3-(phenylsulfonyl)propanamide (6b)

Pure (**6b**) (1.45 g, 96%) was obtained as colorless crystals; mp 136-137 °C (EtOAc + hexane); R_f = 0.41 (EtOAc : *n*-hexane = 1 : 1); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 2.29 (s, 3H, CH_3), 2.89 (t, J = 8.0 Hz, 2H, $SO_2CH_2CH_2$), 3.55 (t, J = 8.0 Hz, 2H, $SO_2C\underline{H}_2CH_2$), 7.07 (d, J = 8.0 Hz, 2H, Ar-H), 7.30 (d, J = 8.0 Hz, 2H, Ar-H), 7.57 (t, J = 7.6 Hz, 2H, Ar-H), 7.66 (t, J = 7.6 Hz, 1H, Ar-H), 7.81 (br s, 1H, NH), 7.94 (d, J = 7.6 Hz, 2H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 20.82, 29.84, 51.92, 119.99, 127.99, 129.44 134.06, 134.20, 134.92, 138.70, (Ar-C), 166.81 (C=O); MS (EI, 70 eV), *m/z* 303 (M^+, 67.34), 197 (1.35), 162 (6.97), 125 (26.80), 107 (100), 106 (20.76), 77 (16.19), 55 (27.12). *Anal. Calcd* for $C_{16}H_{17}NO_3S$: C, 63.34; H, 5.65; N, 4.62. Found: C, 63.32; H, 5.72; N, 4.53.

N-(4-Methoxyphenyl)-3-(phenylsulfonyl)propanamide (6c)

Pure (**6c**) (1.52 g, 95%) was obtained as colorless crystals; mp 118-119 °C (EtOAc + hexane); R_f = 0.24 (EtOAc : *n*-hexane = 1 : 2); ^{1}H-NMR ($CDCl_3$, 200 MHz) δ: 2.85 (t, J = 7.8 Hz, 2H, $SO_2CH_2CH_2$), 3.55 (t, J = 7.8 Hz, 2H, $SO_2CH_2CH_2$), 3.78 (s, 3H, OCH_3), 6.84 (d, J = 9.1 Hz, 2H, Ar-H), 7.33 (d, J = 9.1 Hz, 2H, Ar-H), 7.42 (br s, 1H, NH), 7.54-7.68 (m, 3H, Ar-H), 7.92-7.96 (m, 2H, Ar-H); ^{13}C-NMR ($CDCl_3$, 50 MHz) δ: 29.77, 52.00, 55.46, 114.13, 121.85, 128.03, 129.48, 130.58, 134.09, 138.75, 156.62, 166.82 (C=O); MS (EI, 70 eV), *m/z* 319 (M^+, 100), 125 (15.74), 123 (98.01), 108 (26.44), 77 (7.13), 55 (23.66). *Anal. Calcd* for $C_{16}H_{17}NO_4S$: C, 60.17; H, 5.37; N, 4.39. Found: C, 59.99; H, 5.38; N, 4.30.

N-(4-Fluorophenyl)-3-(phenylsulfonyl)propanamide (6d)

Pure (**6d**) (1.49 g, 97%) was obtained as colorless crys-

tals; mp 117-118 °C (EtOAc + hexane); R_f = 0.32 (EtOAc : *n*-hexane = 1 : 1);^{1}H-NMR (DMSO-d_6 + $CDCl_3$, 200 MHz) δ: 2.94 (t, *J* = 7.22 Hz, 2H, $SO_2CH_2C\underline{H}_2$), 3.57 (t, *J* = 7.22 Hz, 2H, $SO_2C\underline{H}_2CH_2$), 6.88-6.96 (m, 2H, Ar-H), 7.35-7.42 (m, 2H, Ar-H), 7.51-7.71 (m, 3H, ArH), 7.91-7.95 (m, 2H, Ar-H), 8.33 (br s, 1H, NH); ^{13}C-NMR (DMSO-d_6 + $CDCl_3$, 50 MHz) δ: 29.49, 51.87, 115.47 (d, $J_{C\text{-}C\text{-}F}$ = 22.25 Hz), 121.65 (d, $J_{C\text{-}C\text{-}C\text{-}C\text{-}F}$ = 7.80 Hz), 127.88, 129.48, 133.66 (d, $J_{C\text{-}C\text{-}C\text{-}C\text{-}C\text{-}F}$ = 2.65 Hz), 134.17, 138.53, 159.31 (d, $J_{C\text{-}F}$ = 242.20 Hz), 167.13 (C=O); MS (EI, 70 eV), *m/z* 307 (M^+, 15.69), 125 (63.20), 111 (100), 110 (10.02), 77 (16.42), 55 (32.63). *Anal. Calcd* for $C_{15}H_{14}FNO_3S$: C, 58.62; H, 4.59; N, 4.56. Found: C, 58.96; H, 4.85; N, 4.27.

***N*-(4-Chlorophenyl)-3-(phenylsulfonyl)propanamide (6e)**

Pure (**6e**) (1.59 g, 98%) was obtained as colorless crystals; mp 160-161 °C (EtOAc + *n*-hexane); R_f = 0.42 (EtOAc : *n*-hexane = 1 : 1);^{1}H-NMR (DMSO-d_6 + $CDCl_3$, 200 MHz) δ: 2.78 (t, *J* = 7.30 Hz, 2H, $SO_2CH_2C\underline{H}_2$), 3.53 (t, *J* = 7.30 Hz, 2H, $SO_2C\underline{H}_2CH_2$), 7.20, 7.92 (each d, *J* = 8.0 Hz, 4H, Ar-H), 7.49-7.70 (m, 5H, ArH), 10.03 (br s, 1H, NH); ^{13}C-NMR (DMSO-d_6 +$CDCl_3$, 50 MHz) δ: 29.24, 51.01, 120.34, 127.33, 127.40, 127.95, 128.86, 133.38, 137.08, 138.35, 166.89 (C=O); MS (EI, 70 eV), *m/z* 325 (M^{+2}, 4.68), 323 (M^+, 14.32), 197 (10.13), 129 (29.09), 127 (100), 126 (12.53), 125 (90.66), 105 (10.94), 99 (7.21), 77 (28.95), 55 (41.46). *Anal. Calcd* for $C_{15}H_{14}ClNO_3S$: C, 55.64; H, 4.36; N, 4.33. Found: C, 55.86; H, 4.51; N, 4.27.

***N*-(4-Bromophenyl)-3-(phenylsulfonyl)propanamide (6f)**

Pure (**6e**) (1.80 g, 97%) was obtained as colorless crystals; mp 169-170 °C (EtOAc + *n*-hexane); R_f = 0.33 (EtOAc : *n*-hexane = 1 : 1);^{1}H-NMR (DMSO-d_6 + $CDCl_3$, 200 MHz) δ: 2.86 (t, *J* = 7.30 Hz, 2H, $SO_2CH_2C\underline{H}_2$), 3.52 (t, *J* = 7.3 Hz, 2H, $SO_2C\underline{H}_2CH_2$), 7.35, 7.43 (each d, *J* = 9.1 Hz, 4H, Ar-H), 7.52- 7.66 (m, 3H, ArH), 7.92 (dd, *J* = 1.7 Hz, 2H, ArH), 9.63 (br s, 1H, NH); ^{13}C-NMR (DMSO-d_6 + $CDCl_3$, 50 MHz) δ: 29.44, 51.52, 115.95, 121.05, 127.67, 129.07, 131.30, 133.66, 137.34, 138.53, 167.21 (C=O); MS (EI, 70 eV), *m/z* 369 (M^{+2}, 37.67), 367 (M^+, 29.52), 197 (12.77), 173 (91.58), 171 (98.32), 125 (100), 55 (47.33). *Anal. Calcd* for $C_{15}H_{14}BrNO_3S$: C, 48.92; H, 3.83; N, 3.80. Found: C, 49.12; H, 3.51; N, 3.97.

General procedure for the preparation of *N*-aryl acrylamides (7a-f)

Under dry nitrogen, the mixture of *N*-aryl 3-(phenylsulfonyl)propanamides (**6a-f**) (5 mmol) and potassium *tert*-butoxide (0.57 g, 5.05 mmol) was suspended in anhydrous THF (50 mL) at 0 °C for 1 h. At the end of the reaction, which was monitored by silical gel TLC (*n*-hexane : ethyl acetate = 2 : 1), the mixture was poured into a separating funnel and mixed with EtOAc (100 mL). The solution was washed with brine (10 mL × 5), then the organic layer was separated, and dried with anhydrous magnesium sulfate, and filtered. The filtrate was concentrated under a reduced pressure to give the desired compound (**7a-f**), which was purified by silica gel chromatographic column (*n*-hexane/ethyl acetate = 2/1). The results obtained are shown as follows:

***N*-Phenylacrylamide (7a)**

Pure (**7a**) (0.66 g, 90%) was obtained as colorless crystals; mp 103-105 °C (EtOAc + *n*-hexane) [lit.[13b] mp 101-103]; R_f = 0.42 (EtOAc : *n*-hexane = 1 : 1.5); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 5.72 (dd, *J* = 2.0 Hz; 10.0 Hz, 1H, olefinic H), 6.30 (dd, *J* = 10.0 Hz; 17.0 Hz, 1H, olefinic H), 6.42 (dd, *J* = 2.0 Hz; 17.0 Hz, 1H, olefinic H), 7.11 (t, *J* = 7.6 Hz, 1H, Ar-H), 7.31 (t, *J* = 8.4 Hz, 2H, Ar-H), 7.60 (d, *J* = 7.6 Hz, 1H, Ar-H), 8.00 (br s, 1H, NH); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 120.13 (olefinic), 124.47 (olefinic), 127.59, 128.93, 131.24, 137.79 (Ar-C), 163.82 (C=O); MS (EI, 70 eV), *m/z* 147 (M^+, 38.12), 93 (100), 55 (77.04).

***N*-(4-Methylphenyl)acrylamide (7b)**

Pure (**7b**) (0.76 g, 95%) was obtained as colorless crystals; mp 139-140 °C (EtOAc + *n*-hexane) [lit.[18] mp 138-139]; R_f = 0.66 (EtOAc : *n*-hexane = 1 : 1.5); ^{1}H-NMR ($CDCl_3$, 200 MHz) δ: 2.31 (s, 3H, CH_3), 5.72 (dd, *J* = 2.0 Hz; 10.0 Hz, 1H, olefinic H), 6.25 (dd, *J* = 10.0 Hz; 17.0 Hz, 1H, olefinic H), 6.41 (dd, *J* = 2.0 Hz; 17.0 Hz, 1H, olefinic H), 7.12, 7.46 (d, *J* = 8.3 Hz, each 2H, Ar-H), 7.64 (br s, 1H, NH); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 20.90 (CH_3), 120.15 (olefinic), 127.47 (olefinic), 129.52, 131.30, 134.20, 135.20 (Ar-C), 163.82 (C=O); MS (EI, 70 eV), *m/z* 161 (M^+, 74.48), 107 (100), 106 (37.99), 55 (77.04).

***N*-(4-Methoxyphenyl)acrylamide (7c)**

Pure (**7c**) (0.85 g, 96%) was obtained as colorless crystals; mp 99-101 °C (EtOAc + *n*-hexane) [lit.[19] mp 95-96]; R_f = 0.28 (EtOAc : *n*-hexane = 1 : 1.5); ^{1}H-NMR ($CDCl_3$, 200 MHz) δ: 3.78 (s, 3H, OCH_3), 5.69 (dd, *J* = 2.0 Hz; 10.0 Hz, 1H, olefinic H), 6.26 (dd, *J* = 10.0 Hz; 17.0 Hz, 1H, olefinic H), 6.40 (dd, *J* = 2.0 Hz; 17.0 Hz, 1H, olefinic H), 6.83, 7.48 (d, *J* = 9.0 Hz, each 2H, Ar-H), 7.91 (br s, 1H, NH); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 43.58 (OCH_3), 126.62 (olefinic), 127.47 (olefinic), 127.80, 128.63, 130.65, 138.02 (Ar-C), 165.43 (C=O); MS (EI, 70 eV), *m/z* 177 (M^+, 100), 123 (80.28), 122 (27.65), 108 (46.37), 55 (53.01).

***N*-(4-Fluorophenyl)acrylamide (7d)**

Pure (**7d**) (0.743 g, 90%) was obtained as colorless crystals; mp 132-134 °C (EtOAc + *n*-hexane); R_f = 0.57 (EtOAc : *n*-hexane = 1 : 2); ^{1}H-NMR (DMSO-d_6 + $CDCl_3$, 400 MHz) δ: 5.68 (d, *J* = 10.0 Hz, 1H, olefinic H), 6.33 (d, *J* = 16.8 Hz, 1H, olefinic H), 6.43 (dd, *J* = 16.8 Hz, 10.0 Hz, 1H, olefinic H), 6.98-7.02, 7.67-7.70 (m, each 2H, Ar-H), 9.94 (br s, 1H, NH); ^{13}C-NMR (DMSO-d_6 + $CDCl_3$, 100 MHz) δ: 114.70 (d, $J_{c\text{-}c\text{-}F}$ = 22 Hz), 120.99 (d, $J_{c\text{-}c\text{-}c\text{-}c\text{-}F}$ = 7.6 Hz), 126.11 (olefinic C), 131.37 (olefinic C), 134.85 (d, $J_{c\text{-}c\text{-}c\text{-}c\text{-}F}$ = 2.2 Hz), 158.20 (d, $J_{c\text{-}F}$ = 240.5 Hz), 163.19 (C=O); MS (EI, 70 eV), *m/z* 165 (M^+, 41.99), 112 (4.96), 111 (100), 83 (13.41), 55 (50.29). *Anal. Calcd* for C_9H_8NFO: C, 65.45; H, 4.88; N, 8.48. Found: C, 65.67; H, 4.59; N, 8.76.

***N*-(4-Chlorophenyl)acrylamide (7e)**

Pure (**7e**) (8.42 g, 93%) was obtained as colorless crystals; mp 174-176 °C (EtOAc + *n*-hexane); [lit.[20] mp 101-103]; R_f = 0.73 (EtOAc : *n*-hexane = 1 : 2); ^{1}H-NMR (DMSO-d_6 + $CDCl_3$, 400 MHz) δ: 5.71 (dd, *J* = 3.6 Hz; 8.6 Hz, 1H, olefinic H), 6.39 (m, 2H, olefinic H), 7.23-7.27, 7.67-7.70 (m, each 2H, Ar-H), 9.85 (br s, 1H, NH); ^{13}C-NMR (DMSO-d_6 + $CDCl_3$, 100 MHz) δ: 120.24, 125.99, 127.26, 127.68, 130.76, 136.88 (Ar-C), 163.00 (C=O); MS (EI, 70 eV), *m/z* 183 (M^{+2}, 13.36), 181 (M^+, 42.52), 129 (33.54), 127 (100), 55 (70.31); *Anal. Calcd* for C_9H_8NClO: C, 59.52; H, 4.44; N, 7.71. Found: C, 59.74; H, 4.68; N, 7.79.

***N*-(4-Bromophenyl)acrylamide (7f)**

Pure (**7f**) (1.08 g, 96%) was obtained as colorless crystals; mp 179-181 °C (EtOAc + *n*-hexane); [lit.[18] mp 178-179]; R_f = 0.49 (EtOAc : *n*-hexane = 1 : 2); ^{1}H-NMR (DMSO-d_6 + $CDCl_3$, 400 MHz) δ: 5.70 (dd, *J* = 3.0 Hz; 8.6 Hz, 1H, olefinic H), 6.39 (m, 2H, olefinic H), 7.37-7.41 (m, 1H, Ar-H), 7.63 (d, *J* = 8.8 Hz, 1H, Ar-H), 9.89 (br s, 1H, NH); ^{13}C-NMR (DMSO-d_6 + $CDCl_3$, 100 MHz) δ: 115.29, 120.94, 126.37, 130.96, 131.11, 137.72 (Ar-C), 163.33 (C=O); MS (EI, 70 eV), *m/z* 227 (M^{+2}, 14.09), 225 (M^+, 14.05), 173 (34.02), 171 (34.64), 91 (10.54), 55 (100); *Anal. Calcd* for C_9H_8NBrO: C, 47.82; H, 3.57; N, 6.20. Found: C, 47.86; H, 3.51; N, 5.98.

General procedure for one-pot preparation of *N*-Allyl *N*-aryl acrylamide (8a-f)

Under dry nitrogen, the mixture of *N*-aryl 3-(phenylsulfonyl)propanamides (**7a-f**) (5 mmol) and potassium *tert*-butoxide (0.57 g, 5.01 mmol) was suspended in anhydrous THF (100 mL) and stirred at 0 °C for 1 h. Then the mixture was added with an additional *tert*-butoxide (0.57 g, 5.01 mmol), and subsequently followed with allyl bromide (5.01 mmol), and stirred continually at 0 °C for 1 h. At the end of the reaction, which was monitored by silica gel TLC (hexane/ethyl acetate = 2/1), the mixture was concentrated to remove THF under a reduced pressure. The residue was mixed with EtOAc (100 mL), and washed with brine water (10 mL × 5). Then the solution was dried with anhydrous magnesium sulfate, and filtered. The filtrate was concentrated under a reduced pressure to give the desired compound (**8a-f**), which was purified by silica gel chromatographic column (*n*-hexane/ethyl acetate = 2/1).

***N*-Allyl *N*-Phenylacrylamide (8a)[8b]**

Pure (**8a**) (0.66 g, 70%) was obtained as colorless liquid; R_f = 0.45 (EtOAc : *n*-hexane = 1 : 3); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 4.38 (dt, *J* = 6.4 Hz, 1.2 Hz, 2H, allyl H), 5.09 (dd, *J* = 1.2 Hz; 8.0 Hz, 1H, olefin H), 5.12 (br s, 1H, olefin H), 5.50 (dd, *J* = 10.2 Hz; 1.6 Hz, 1H, olefin H), 5.84-5.93 (m, 1H, olefin H), 6.04 (dd, *J* = 10.4 Hz; 16.6 Hz, 1H, olefin H), 6.37 (dd, *J* = 2.4 Hz; 16.6 Hz, 1H, olefin H), 7.14-7.16 (m, 2H, Ar-H), 7.30-7.42 (m, 3H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 51.97, 117.44, 127.21, 127.38, 127.76, 128.34, 129.08, 132.59, 141.57, 164.79 (C=O); MS (EI, 70 eV), *m/z* 187 (M^+, 24.18), 172 (19.51), 159 (12.40), 144 (7.66), 133 (29.07), 132 (50.04), 106 (23.14), 93 (22.18), 77 (35.68), 55 (100); HRMS: Calcd for $C_{12}H_{13}NO$: 187.0997. Found: 187.1027.

***N*-Allyl *N*-(4-Methylphenyl)acrylamide (8b)**

Pure (**8b**) (0.75 g, 75%) was obtained as colorless liquid; bp 135-145 °C (2.5 mmHg); R_f = 0.34 (EtOAc : *n*-hexane = 1 : 3); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 2.36 (s, 3H, CH_3), 4.36 (dt, *J* = 6.0 Hz, 1.2 Hz; 2H, allyl H), 5.08 (d, *J* = 7.6 Hz, 1H, allyl H), 5.11 (br s, 1H, allyl H), 5.48 (dd, $J_{gem\text{-}cis}$ = 2.0 Hz; 10.4 Hz, 1H, vinyl H), 5.83-5.92 (m, 1H, allyl H), 6.05 (dd, $J_{cis\text{-}trans}$ = 10.4; 16.8 Hz, 1H, vinyl H), 6.36 (dd, $J_{gem\text{-}trans}$ = 2.0 Hz; 16.8 Hz, 1H, vinyl H), 7.04, 7.19 (d, *J* = 8.4 Hz, each 2H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 20.61 (CH_3), 51.92 (CH_2), 117.34, 126.93, 127.53, 128.37, 129.65, 132.64, 137.23, 138.89, 164.80; MS (EI, 70 eV), *m/z* 201 (M^+, 27.43), 186 (13.22), 147 (28.38), 146 (35.74), 144 (10.01), 132 (20.70), 120 (24.31), 118 (18.98), 107 (37.34), 91 (39.19), 77 (16.36), 65 (31.14), 55 (100); HRMS: Calcd for $C_{13}H_{15}NO$: 201.1154. Found: 201.1152.

***N*-Allyl *N*-(4-methoxyphenyl)acrylamide (8c)**

Pure (**8c**) (0.82 g, 76%) was obtained as colorless liquid; bp 165-170 °C (3 mmHg); R_f = 0.54 (EtOAc : *n*-hexane = 1 : 3); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 3.83 (s. 3H, OCH_3), 4.34 (dt, *J* = 6.0 Hz, 1.2 Hz; 2H, allylic H), 5.07 (d, *J* = 1.6

Hz, 1H, allyl H), 5.11-5.14 (m, 1H, allyl H), 5.51 (dd, $J_{gem\text{-}cis}$ = 2.0 Hz; 10.4 Hz, 1H, vi nyl H), 5.83-5.93 (m, 1H, allyl H), 6.04 (dd, $J_{cis\text{-}trans}$ = 10.4 Hz, 16.8 Hz, 1H, vi nyl H), 6.36 (dd, $J_{gem\text{-}trans}$ = 2.0 Hz; 16.8 Hz, 1H, vi nyl H), 7.89-6.92 (m, 2H, Ar-H), 7.05-7.09 (m, 2H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 52.35 (CH_2), 55.35 (OCH_3), 114.47, 117.80, 127.35, 128.58, 129.24, 132.92, 134.49, 158.84, 165.41 (C=O); MS (EI, 70 eV), *m/z* 217 (M^+, 48.23), 163 (32.07), 148 (26.43), 147 (15.77), 134 (35.98), 130 (19.78), 123 (59.82), 120 (11.51), 108 (29.89), 94 (40.08), 77 (31.59), 64 (21.74), 55 (100); HRMS: Calcd for $C_{13}H_{15}NO$: 217.1103. Found: 217.1103.

_N_-Allyl _N_-(4-fluorolphenyl)acrylamide (8d)

Pure (**8d**) (0.80 g, 78%) was ob tained as col or less liquid; R_f = 0.43 (EtOAc : *n*-hex ane = 1 : 3); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 4.36 (dt, *J* = 6.0 Hz, 1.2 Hz, 2H, allyl H), 5.08 (br s, 1H, allyl H), 5.14 (d, *J* = 10.8 Hz, 1H, allyl H), 5.55 (dd, $J_{gem\text{-}cis}$ = 2.0 Hz; 10.0 Hz, 1H, vi nyl H), 5.83-5.92 (m, 1H, allyl H), 6.02 (dd, $J_{cis\text{-}trans}$ = 10.0 Hz; 16.8 Hz, 1H, vi nyl H), 6.39 (dd, $J_{gem\text{-}trans}$ = 2.0 Hz; 16.8 Hz, 1H, vi nyl H), 7.07-7.17 (m, 4H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 52.16, 116.12 (d, $J_{C\text{-}c\text{-}c\text{-}F}$ = 8.4 Hz), 117.92, 127.76, 128.17, 129.75 (d, $J_{C\text{-}c\text{-}F}$ = 22.8 Hz), 132.54, 137.68, 161.52 (d, $J_{C\text{-}F}$ = 246.5 Hz), 164.97; MS (EI, 70 eV), *m/z* 205 (M^+, 21.72), 190 (17.87), 177 (11.56), 151 (36.14), 150(44.70), 148 (11.09), 124 (17.08), 122 (18.68), 111 (25.51), 95 (34.66), 94 (14.18), 55 (100); HRMS: Calcd for $C_{12}H_{12}NFO$: 205.0903. Found: 205.0903.

_N_-Allyl _N_-(4-Chlorolphenyl)acrylamide (8e)

Pure (**8e**) (0.80 g, 72%) was ob tained as col or less liquid; R_f = 0.49 (EtOAc : *n*-hex ane = 1 : 3); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 4.36 (dt, *J* = 6.0 Hz, 1.2 Hz, 2H, allyl H), 5.08 (d, *J* = 1.2 Hz, 1H, allyl H), 5.14 (d, *J* = 10.4 Hz, 1H, allyl H), 5.56 (dd, $J_{gem\text{-}cis}$ = 2.0 Hz, 10.2 Hz, 1H, vi nyl H), 5.82-5.92 (m, 1H, allyl H), 6.03 (dd, $J_{cis\text{-}trans}$ = 10.2 Hz, 16.8 Hz, 1H, vi nyl H), 6.39 (dd, $J_{gem\text{-}trans}$ = 2.0 Hz, 16.8 Hz, 1H, vi nyl H), 7.09-7.13 (m, 2H, Ar-H); 7.36-7.39 (m, 2H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 52.21, 118.11, 128.13, 128.27, 129.36, 129.54, 132.58, 133.48, 140.37, 165.01; MS (EI, 70 eV), *m/z* 223 (M^{+2}, 4.95), 221 (M^+, 17.80), 206 (10.33), 178 (5.66), 167 (38.12), 166 (28.05), 140 (20.00), 130 (18.60), 127 (24.45), 111 (16.02), 94 (15.78), 75 (13.48), 55 (100); HRMS: Calcd for $C_{12}H_{12}NCl^{35}O$: 221.0607. Found: 221.0607.

_N_-Allyl _N_-(4-Bromolphenyl)acrylamide (8f)

Pure (**8f**) (1.04 g, 78%) was ob tained as col or less liquid; R_f = 0.41 (EtOAc : *n*-hex ane = 1 : 3); ^{1}H-NMR ($CDCl_3$, 400 MHz) δ: 4.32 (dt, *J* = 6.0 Hz, 1.2 Hz; 2H, allyl H), 5.04 (d, *J* = 1.2 Hz, 1H, allyl H), 5.10 (d, *J* = 10.4 Hz, 1H, allyl H), 5.53 (dd, $J_{gem\text{-}cis}$ = 2.0 Hz, 10.2 Hz, 1H, vi nyl H), 5.78-5.82 (m, 1H, allyl H), 6.01 (dd, $J_{cis\text{-}trans}$ = 10.2 Hz, 16.8 Hz, 1H, vinyl H), 6.39 (dd, $J_{gem\text{-}trans}$ = 2.0 Hz, 16.8 Hz, 1H, vi nyl H), 7.00-7.02 (m, 2H, Ar-H); 7.47-7.50 (m, 2H, Ar-H); ^{13}C-NMR ($CDCl_3$, 100 MHz) δ: 52.17, 118.13, 121.43, 128.18, 128.25, 129.69, 132.55, 140.87, 164.95; MS (EI, 70 eV), *m/z* 267 (M^{+2}, 5.11), 266 (2.38), 265 (M^+, 5.14), 211 (7.26), 184 (6.56), 171(6.51), 157 (4.99), 130 (13.53), 94 (9.24), 76 (9.21), 55 (100); HRMS: Calcd for $C_{12}H_{12}NBr^{79}O$: 265.0102. Found: 265.0103.

General procedure for _N_-aryl α,β-unsaturated γ-lactams (9a-f)[16b]

Com pound **9a-f** (1 mmol) dis solved in an hy drous to luene (30 mL), was added with Grubbs cat a lyst (0.05 mmol). The mix ture was stirred for 3 h at 80 °C un der dry ar gon. The sol vent was re moved un der vac uum, and the res i due was subjected to a sil ica-gel col umn (*n*-hex ane/MTBE = 1/1) to give **9a-f** in mod er ate yields.

_N_-Phenyl α,β-unsaturated γ-lactam (9a)

Pure **9a** (0.09g, 57%) was ob tained as col or less crys tal, mp 85-86 °C (EtOAc + *n*-hex ane) [lit.[16a] 86 °C]; R_f = 0.53 (EtOAc : *n*-hex ane = 1 : 1); IR ν_{max} (CH_2Cl_2) cm^{-1}: 1692.11, 1596.95; ^{1}H-NMR (400 MHz, $CDCl_3$) δ: 4.39 (t, *J* = 2.0 Hz, 2H, H-5), 6.22 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-3), 7.14 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-4), 7.11 (m, 1H, ArH), 7.35 (m, 2H, ArH), 7.68 (m, 2H, ArH); ^{13}C-NMR (100 MHz, CDCl) δ: 53.03 (C-5), 118.65, 123.97, 128.89 (C-3), 138.93, 142.26 (C-4), 169.99 (C=O); MS (EI, 70 eV): *m/z* 159 (M^+, 100), 131 (13.16), **130** (60.69), **104** (41.53), **77** (43.44), 51 (12.08); HRMS: Calcd for C_9H_9NO: 159.0684. Found: 159.0684.

_N_-(4-Methylphenyl) α,β-unsaturated γ-lactam (9b)

Pure **9b** (0.11g, 64%) was ob tained as col or less crys tal, mp 96-97 °C (EtOAc + *n*-hex ane) [lit.[16a] 95 °C]; R_f = 0.56 (EtOAc : *n*-hex ane, 1 : 1); IR ν_{max} (CH_2Cl_2) cm^{-1}: 1694.00, 1598.15; ^{1}H-NMR (400 MHz, $CDCl_3$) δ : 2.33 (s, 3H, CH_3), 4.42 (t, *J* = 2.0 Hz, 2H, H-5), 6.26 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-3), 7.15 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-4); 7.18, 7.57 (each d, *J* = 8.0 Hz, 2-H, ArH); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 20.77 (CH_3), 53.38 (C-5), 119.12, 129.24, 129.59 (C-3), 133.91, 136.55, 141.95 (C-5), 170.04 (C=O); MS (EI, 70 eV): *m/z* 173 (M^+, 100), 145 (13.97), **144** (64.39), 130 (24.74), **118** (22.53), **91** (28.87), 65 (11.51), HRMS: Calcd for $C_{11}H_{11}NO$: 173.0841. Found: 173.0841.

***N*-(4-Methoxylphenyl) α,β-unsaturated γ-lactam (9c)**

Pure **9c** (0.10 g, 53%) was obtained as colorless crystal, mp 103-104 °C (EtOAc + *n*-hexane) [lit.[16a] 103°C]; R_f = 0.40 (EtOAc : *n*-hexane, 1 : 1); IR ν_{max} (CH_2Cl_2) cm^{-1}: 1681.30, 1609.21; ^{1}H-NMR (400 MHz, $CDCl_3$) δ: 3.81 (s, 3H, OCH_3), 4.41 (t, *J* = 2.0 Hz, 2H, H-5), 6.27 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-3), 6.91-6.94 (m, 2H, ArH), 7.15 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-4), 7.57-7.60 (m, 2H, ArH); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 53.38 (C-5), 55.33 (OCH_3), 114.16, 114.40 120.99, 129.24 (C-3), 141.70 (C-4), 156.37, and 169.81 (C=O); MS (EI, 70 eV): *m/z* 189 (M^+, 100), 174 (34.59), **160** (18.77), 146 (27.44), **134** (23.34), **107** (7.47), 92 (7.47), 77 (9.47); HRMS: Calcd for $C_{11}H_{11}NO_2$: 189.0790. Found: 189.0789.

***N*-(4-Fluorophenyl) α,β-unsaturated γ-lactam (9d)**

Pure **9d** (0.11 g, 62%) was obtained as colorless crystal, mp 72-73 °C (EtOAc + *n*-hexane), R_f = 0.47 (EtOAc : *n*-hexane = 1 : 1); IR ν_{max} (CH_2Cl_2) cm^{-1}: 1680.59, 1594.80; ^{1}H-NMR (400 MHz, $CDCl_3$) δ: 4.34 (t, *J* = 2.0 Hz, 2H, H-5), 6.19 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-3), 6.96-7.02 (m, 2H, ArH), 7.10 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-4); 7.55-7.61 (m, 2H, ArH), ^{13}C NMR (100 MHz, $CDCl_3$) δ: 53.42 (C-5), 115.69 (d, $J_{c\text{-}c\text{-}F}$ = 21.3 Hz), 120.70 (d, $J_{c\text{-}c\text{-}c\text{-}F}$ = 9.1 Hz), 129.11 (C-3), 135.17 (s, $J_{c\text{-}c\text{-}c\text{-}c\text{-}F}$ = 0 Hz), 142.17 (C-4), 159.31 (d, $J_{c\text{-}F}$ = 242.7 Hz), 168.98 (C=O); MS (EI, 70 eV): *m/z* 177 (M^+, 100), 149 (18.84), **148** (86.95), **122** (36.58), **95** (32.10), 75 (12.47); HRMS: Calcd for $C_{10}H_8FNO$: 177.0590. Found: 177.0592.

***N*-(4-Chlorophenyl) α,β-unsaturated γ-lactam (9e)**

Pure **9e** (0.11 g, 57%) was obtained as colorless crystal, mp 76-77 °C (EtOAc + *n*-hexane), R_f = 0.53 (EtOAc : *n*-hexane = 1 : 1); IR ν_{max} (CH_2Cl_2) cm^{-1}: 1690.68, 1594.47; ^{1}H-NMR (400 MHz, $CDCl_3$) δ: 4.38 (t, *J* = 2.0 Hz, 2H, H-5), 6.22 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-3), 7.17 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-4); 7.29-7.31 (m, 2H, ArH), and 7.63-7.65 (m, 2H, ArH); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 52.97 (C-5), 119.70 (Ar-C), 126.95 (Ar-C), 128.79 (C-3), 134.12 (Ar-C), 137.51 (Ar-C), 142.41 (C-4), 169.99 (C=O); MS (EI, 70 eV): *m/z* 195 (M^{+2}, 35.09), 193 (M^+, 100), 166 (15.52), **164** (42.67), 140 (17.90), **138** (45.11), 130 (41.46), 113 (11.08), **111** (32.99), 75 (15.48); HRMS: Calcd for $C_{10}H_8ClNO$: 193.0294. Found: 193.0294.

***N*-(4-Bromophenyl) α,β-unsaturated γ-lactam (9f)**

Pure **9f** (0.15 g, 63%) was obtained as colorless crystal, mp 85-86 °C (EtOAc + *n*-hexane), R_f = 0.54 (EtOAc : *n*-hexane = 1 : 1); IR ν_{max} (CH_2Cl_2) cm^{-1}: 1682.77, 1585.45; ^{1}H-NMR (400 MHz, $CDCl_3$) δ: 4.40 (t, *J* = 2.0 Hz, 2H, H-5), 6.25 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-3), 7.19 (dt, *J* = 6.0 Hz, *J* = 2.0 Hz, 1H, H-4); 7.44-7.48 (m, 2H, ArH), 7.60-7.63 (m, 2-H, ArH); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 52.94 (C-5), 116.75 (Ar-C), 120.06 (Ar-C), 129.04 (C-3), 131.94 (Ar-C), 138.12 (Ar-C), 142.32 (C-4), 170.02 (C=O); MS (EI, 70 eV): *m/z* 239 (M^{+2}, 100), 237 (M^+, 99.52), 210 (35.74), **208** (35.92), 184 (49.99), **182** (48.75), 157 (34.38), **155** (33.24), 130 (64.68), 103 (7.84), 79 (14.63), 76 (20.45), 75 (17.56); HRMS: Calcd for $C_{10}H_8BrNO$: 236.9798. Found: 236.9800.

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Key Words

N-aryl 3-(phenylsulfonyl)propanamides; *N*-aryl 2-alkenamides; *N*-allyl *N*-aryl 2-alkenamides; *N*-aryl α,β-unsaturated γ-lactams.

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