Hydriodic Acid-Mediated Cyclization of α-Substituted Secondary 2-Ethenylbenzamides: Synthesis of 2-Substituted 2,3-Dihydro-3,3-dimethyl-1*H*-isoindol-1-ones and 3,3-Disubstituted (*E*)-1-(Arylimino)-1,3-dihydroisobenzofurans

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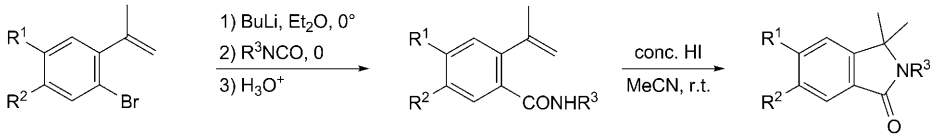
A new and facile method for the preparation of 2-substituted 2,3-dihydro-3,3-dimethyl-1*H*-isoindol-1-ones **3** and 3,3-disubstituted (*E*)-1-(arylimino)-1,3-dihydroisobenzofurans **6** has been developed. Thus, treatment of *N*-alkyl(or aryl)-2-(1-methylethen-1-yl)benzamides **2** with concentrated hydriodic acid (HI) in MeCN at room temperature afforded **3**. Similar treatment of *N*-aryl-2-(1-phenylethen-1-yl)benzamide **5** with concentrated HI at 0° afforded **6**.

Introduction. – We previously reported a synthesis of 3,3-disubstituted-2,3-dihydro-1*H*-isoindol-1-ones based on iodoamination of α-substituted secondary 2-ethenylbenzamides, which could be prepared by the reaction of α-substituted 2-lithiostyrenes with isocyanates [1]. As an extension of this work, we herein describe the results of our study on HI-mediated cyclization of α-substituted secondary 2-ethenylbenzamides, which provide concise and efficient synthetic routes to 2-substituted 2,3-dihydro-3,3-dimethyl-1*H*-isoindol-1-ones and 3,3-disubstituted (*E*)-1-(arylimino)-1,3-dihydroisobenzofurans depending on the α-substituents of α-substituted secondary 2-ethenylbenzamides. The synthesis of 2,3-dihydro-1*H*-isoindol-1-ones has recently attracted considerable attention owing to the occurrence of biological active compounds containing this heterocyclic system [2]. A number of methods for the synthesis of this system have been developed [3]. However, most of these methods require several steps and/or involve tedious reaction conditions. On the other hand, a few general methods have been reported for the preparation of 1-(alkyl(or aryl)imino)-1,3-dihydroisobenzofuran derivatives [4]. For example, *Kunai* and co-workers have reported a synthesis of 3,3-disubstituted 1-(*tert*-octylimino)-1,3-dihydroisobenzofurans by three-component coupling using arynes and *tert*-octyl isocyanide [4a][4c]. This class of molecules may be of biological interest, because a number of molecules, which have a related isobenzofuran-1(3*H*)-one (phthalide) structure, have exhibited a variety of biological activities [5].

Results and Discussion. – 2,3-Dihydro-3,3-dimethyl-1*H*-isoindol-1-ones **3** were synthesized from 2-bromo-α-methylstyrenes **1** *via* *N*-alkyl(or aryl)-2-(1-methylethen-1-yl)benzamides **2** as outlined in *Scheme 1*. The 2-ethenylbenzamides **2** were prepared

from the 2-bromostyrenes **1** as described in [1]. Thus, Li/Br exchange between **1** and BuLi in Et_2O at 0° generated the corresponding 2-lithiostyrene derivatives. These were then allowed to react with isocyanates to afford 2-ethenylbenzamides **2** in moderate-to-fair yields. First, 2-(1-methylethen-1-yl)-*N*-phenylbenzamide (**2a**) was treated with 2 mol-equiv. of HI in MeCN at room temperature to yield the desired 2,3-dihydro-3,3-dimethyl-2-phenyl-1*H*-isoindol-1-one (**3a**) in fair yield. The IR and ^{1}H-NMR spectra were identical to those reported in [1]. The use of less than 2 mol-equiv. of HI gave decreased yields of the desired product. Conversion of the other 2-(1-methylethen-1-yl)benzamides **2b**–**2e** to the 2,3-dihydro-1*H*-isoindol-1-ones **3b**–**3e**, respectively, was performed under the same conditions in comparable yields. These results are summarized in *Table 1*.

Scheme 1



1a $R^1 = R^2 = H$
1b R^1 = MeO, $R^2 = H$
1c $R^1 = R^2$ = MeO

2 **3**

Table 1. *Preparation of 2,3-Dihydro-1*H*-isoindol-1-ones* **3** *from* **1** via **2**

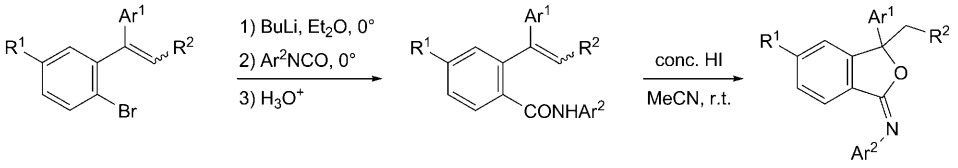
Entry	Starting material	R^3	Intermediate	Yield[a]) [%]	Product	Yield[a]) [%]
1	**1a**	Ph	**2a**	65	**3a**	72
2	**1a**	4-Cl–C_6H_4	**2b**	58	**3b**	69
3	**1b**	Ph	**2c**	59	**3c**	62
4	**1b**	*t*-Bu	**2d**	64	**3d**	69
5	**1c**	Ph	**2e**	60	**3e**	70

[a]) Yields of isolated products.

Subsequently, we investigated the cyclization of *N*-aryl-2-(1-arylethen-1-yl)benzamides **5**, which can also be prepared by reacting 2-lithio-α-arylstyrenes, generated from 2-bromo-α-arylstyrenes **4** and BuLi, with aryl isocyanates, as illustrated in *Scheme 2*. The yields of **4** are summarized in *Table 2*, which indicates that they are moderate-to-fair. First, we examined the reaction of *N*-phenyl-2-(1-phenylethen-1-yl)benzamide (**5a**) with concentrated HI under similar conditions as described for the preparation of 2,3-dihydro-1*H*-isoindol-1-ones **3** (*Scheme 2*). The reaction was complete at 0° in 1 h, and the precipitated product was collected. However, we found that the spectroscopic data (IR and ^{1}H-NMR) of this product were not identical to those of previously prepared 2,3-dihydro-3-methyl-2,3-diphenyl-1*H*-isoindol-1-one [1]. We determined the structure of this product to be (*E*)-1,3-dihydro-3-methyl-3-phenyl-1-(phenylimino)isobenzofuran (**6a**) on the basis of its spectroscopic data and elemental analysis (see *Exper. Part*). The signal assignable to H–C(7) appears at considerable lowfield (δ(H) 9.98), probably due to the deshielding effect of the benzene ring of the 1-phenylimino group. The (*E*)-configuration was unambiguously determined by NOE

experiments. Thus, irradiation of the signal at δ(H) 9.98 assignable to H–C(7) resulted in an enhancement (15%) of the signal at δ(H) 8.08 assignable to *ortho*-H-atoms of the benzene ring of the 1-phenylimino group. Similar treatment of the other *N*-aryl-2-(1-arylethen-1-yl)benzamides **5b**–**5f** led to the formation of the 3,3-disubstituted (*E*)-2-(arylimino)-1,3-isobenzofurans **6b**–**6f**, respectively. The yields of the products are also listed in *Table 2* which indicates that good yields are generally realized, while *N*-phenyl-2-(2-phenyl-3-methylethen-1-yl)benzamide (**5f**) gave the corresponding desired product **6f** in somewhat lower yield (*Entry 6*). The β-Me group of the vinyl moiety may render this cyclization difficult. The formation of the dihydro-imino-isobenzofuran structure is ascribed to the steric hindrance due to two aryl groups of the 2,3-diaryl-2,3-dihydro-1*H*-isoindol-1-one structure.

Scheme 2



4a $R^1 = R^2 = H$, Ar^1 = Ph
4b $R^1 = R^2 = H$, Ar^1 = 4-Me–C_6H_4
4c R^1 = MeO, $R^2 = H$, Ar^1 = Ph
4d $R^1 = H$, R^2 = Me, Ar^1 = Ph

5

6

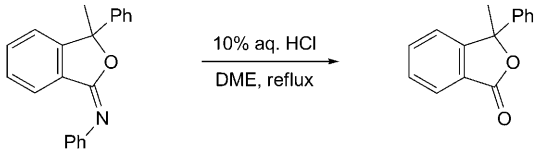
Table 2. *Preparation of* (E)*-1-(Arylimino)-2,3-dihydroisobenzofurans* **6** *from* **4** via **5**

Entry	Starting material	Ar^2	Intermediate	Yield[a]) [%]	**6**	Yield[a]) [%]
1	**4a**	Ph	**5a**	53	**6a**	86
2	**4a**	4-Cl–C_6H_4	**5b**	63	**6b**	93
3	**4a**	4-Br–C_6H_4	**5c**	62	**6c**	89
4	**4b**	4-Cl–C_6H_4	**5d**	55	**6d**	88
5	**4c**	Ph	**5e**	59	**6e**	80
6	**4d**	Ph	**5f**	51	**6f**	66

[a]) Yields of isolated products.

The 1,3-dihydro-1-iminoisobenzofuran structure was further confirmed by converting **6a** to 3-methyl-3-phenylisobenzofuran-1(3*H*)-one (**7**) by acid hydrolysis, as shown in *Scheme 3*.

Scheme 3



6a

7 (79%)

In conclusion, the results mentioned above demonstrate that 2-substituted 2,3-dihydro-3,3-dimethyl-1*H*-isoindol-1-one and 3,3-disubstituted (*E*)-1-(arylimino)-1,3-dihydroisobenzofurans can be prepared from α-substituted 2-bromostyrenes and isocyanates. The method should be useful in the synthesis of these classes of heterocyclic compounds, because the starting materials are readily available, and the operations are very simple.

Experimental Part

General. All of the org. solvents used in this study were dried over appropriate drying agents and distilled prior to use. TLC: *Kieselgel 60 PF_{254}* (*Merck*). Column chromatography (CC): *Kieselgel 60* (0.063 – 0.200 mm; *Merck*). M.p.: *Laboratory Devices MEL-TEMP II*; uncorrected. IR Spectra: *Shimadzu FTIR-8300* spectrophotometer; $\tilde{\nu}$ in cm^{-1}. ^{1}H-NMR Spectra: *JEOL ECP500* FT NMR spectrometer at 500 MHz or *JEOL LA400* FT NMR spectrometer at 400 MHz in $CDCl_3$; δ in ppm rel. to Me_4Si as internal standard, *J* in Hz. ^{13}C-NMR Spectra: *JEOL ECP500* FT NMR spectrometer at 125 MHz; δ in ppm rel. to Me_4Si as internal standard. LR-EI-MS: *JEOL JMS AX505 HA* spectrometer at 70 eV; in *m*/*z* (rel. %).

α-Substituted 2-Bromostyrenes **1a** [6], **1b** [7], **1c** [7], **4a** [8], **4b** [9], **4c** [10], and **4d** [11] were prepared by the appropriate reported methods. All other chemicals used in this study were commercially available.

α-Substituted 2-Ethenylbenzamides **2** *and* **5**. These compounds were prepared by reacting α-substituted 2-lithiostyrenes, generated by the Br/Li exchange between **1** and BuLi, with isocyanates under the conditions previously reported by us [1].

N-*(4-Chlorophenyl)-2-(1-methylethen-1-yl)benzamide* (**2b**). White solid. M.p. 138 – 140° (hexane/THF). IR (KBr): 3279, 3244, 1655, 1603. ^{1}H-NMR (500 MHz): 2.09 (*s*, 3 H); 5.21 (*s*, 1 H); 5.34 (*s*, 1 H); 7.28 (*dd*, *J* = 7.8, 0.9, 1 H); 7.32 (*d*, *J* = 8.7, 2 H); 7.40 (*ddd*, *J* = 7.8, 7.3, 0.9, 1 H); 7.46 (*ddd*, *J* = 7.8, 7.3, 1.4, 1 H); 7.54 (*d*, *J* = 8.7, 2 H); 7.79 (*dd*, *J* = 7.8, 1.4, 1 H); 7.99 (br. *s*, 1 H). Anal. calc. for $C_{16}H_{14}ClNO$ (271.74): C 70.72, H 5.19, N 5.15; found: C 70.65, H 5.24, N 5.19.

4-Methoxy-2-(1-methylethen-1-yl)-N-*phenylbenzamide* (**2c**). White solid. M.p. 80 – 83° (hexane/THF). IR (KBr): 3266, 3231, 1655, 1599. ^{1}H-NMR (500 MHz): 2.09 (*s*, 3 H); 3.87 (*s*, 3 H); 5.24 (*s*, 1 H); 5.35 (*s*, 1 H); 6.76 (*d*, *J* = 2.3, 1 H); 6.91 (*dd*, *J* = 8.2, 2.3, 1 H); 7.29 – 7.40 (*m*, 3 H); 7.57 (*d*, *J* = 7.8, 2 H); 7.83 (*d*, *J* = 8.2, 1 H); 8.07 (br. *s*, 1 H). Anal. calc. for $C_{17}H_{17}NO_2$ (267.32): C 76.38, H 6.41, N 5.24; found: C 76.26, H 6.40, N 5.17.

N-*(1,1-Dimethylethyl)-4-methoxy-2-(1-methylethen-1-yl)benzamide* (**2d**). A pale-yellow solid. M.p. 70 – 73° (hexane/CH_2Cl_2). IR (KBr): 3291, 1632, 1605. ^{1}H-NMR (500 MHz): 1.41 (*s*, 9 H); 2.08 (*d*, *J* = 0.9, 3 H); 3.83 (*s*, 3 H); 5.09 (*d*, *J* = 0.9, 1 H); 5.22 (*quint.*, *J* = 0.9, 1 H); 6.15 (br. *s*, 1 H); 6.68 (*d*, *J* = 2.7, 1 H); 6.84 (*dd*, *J* = 8.7, 2.7, 1 H); 7.67 (*d*, *J* = 8.7, 1 H). Anal. calc. for $C_{15}H_{21}NO_2$ (247.33): C 72.84, H 8.56, N 5.66; found: C 72.59, H 8.60, N 5.42.

4,5-Dimethoxy-2-(1-methylethen-1-yl)-N-*phenylbenzamide* (**2e**). A pale-yellow solid. M.p. 125 – 128° (hexane/CH_2Cl_2). IR (KBr): 3271, 3242, 1645, 1599. ^{1}H-NMR (500 MHz): 2.09 (*s*, 3 H); 3.94 (*s*, 6 H); 5.25 (*s*, 1 H); 5.38 (*s*, 1 H); 6.72 (*s*, 1 H); 7.32 – 7.38 (*m*, 3 H); 7.43 (*s*, 1 H); 7.58 (*d*, *J* = 7.8, 2 H); 8.19 (br. *s*, 1 H). Anal. calc. for $C_{18}H_{19}NO_3$ (297.35): C 72.71, H 6.44, N 4.71; found: C 72.92, H 6.53, N 4.51.

N-*(4-Chlorophenyl)-2-(1-phenylethen-1-yl)benzamide* (**5b**). White solid. M.p. 140 – 143° (hexane/THF). IR (KBr): 3266, 3239, 1651. ^{1}H-NMR (500 MHz): 5.45 (*s*, 1 H); 5.85 (*s*, 1 H); 7.10 (*d*, *J* = 8.7, 2 H); 7.17 – 7.28 (*m*, 5 H); 7.42 (*d*, *J* = 7.3, 1 H); 7.48 (*m*, 5 H); 7.80 (*d*, *J* = 7.3, 1 H). Anal. calc. for $C_{21}H_{16}ClNO$ (333.81): C 75.56, H 4.83, N 4.20; found: C 75.56, H 4.73, N 4.12.

N-*(4-Bromophenyl)-2-(1-phenylethen-1-yl)benzamide* (**5c**). White solid. M.p. 150 – 152° (hexane/THF). IR (KBr): 3235, 3173, 1651. ^{1}H-NMR (500 MHz): 5.44 (*s*, 1 H); 5.79 (*s*, 1 H); 7.13 (*d*, *J* = 8.7, 2 H); 7.23 (*s*, 5 H); 7.32 (*d*, *J* = 8.7, 2 H); 7.41 (*d*, *J* = 7.8, 1 H); 7.47 (*ddd*, *J* = 7.8, 7.3, 1.4, 1 H); 7.53 (*ddd*, *J* = 7.8, 7.3, 1.4, 1 H); 7.66 (*dd*, *J* = 7.8, 1.4, 1 H); 8.13 (br. *s*, 1 H). Anal. calc. for $C_{21}H_{16}BrNO$ (378.26): C 66.68, H 4.26, N 3.70; found: C 66.50, H 4.32, N 3.82.

N-*(4-Chlorophenyl)-2-[1-(4-methylphenyl)ethen-1-yl]benzamide* (**5d**). White solid. M.p. 115–118° (hexane/CH_2Cl_2). IR (KBr): 3256, 3235, 1651. ^{1}H-NMR (500 MHz): 2.29 (*s*, 3 H); 5.39 (*s*, 1 H); 5.82 (*s*, 1 H); 7.04 (*d*, *J* = 8.2, 2 H); 7.12 (*d*, *J* = 8.2, 2 H); 7.13 (*d*, *J* = 8.7, 2 H); 7.19 (*d*, *J* = 8.7, 2 H); 7.40 (*dd*, *J* = 7.3, 1.4, 1 H); 7.48 (*td*, *J* = 7.3, 1.4, 1 H); 7.54 (*td*, *J* = 7.3, 1.4, 1 H); 7.61 (br. *s*, 1 H); 7.82 (*dd*, *J* = 7.3, 1.4, 1 H). Anal. calc. for $C_{22}H_{18}ClNO$ (347.84): C 75.97, H 5.22, N 4.03; found: C 75.76, H 5.33, N 3.76.

4-Methoxy-N-*phenyl-2-(1-phenylethen-1-yl)benzamide* (**5e**). White solid. M.p. 117–120° (hexane/THF). IR (KBr): 3296, 1654. ^{1}H-NMR (500 MHz): 3.89 (*s*, 3 H); 5.47 (*s*, 1 H); 5.89 (*s*, 1 H); 6.90 (*d*, *J* = 2.7, 1 H); 7.00 (*dd*, *J* = 8.7, 2.7, 1 H); 7.04 (*t*, *J* = 7.3, 1 H); 7.16–7.27 (*m*, 9 H); 7.65 (br. *s*, 1 H); 7.85 (*d*, *J* = 8.7, 1 H). Anal. calc. for $C_{22}H_{19}NO_2$ (329.39): C 80.22, H 5.81, N 4.25; found: C 80.06, H 5.94, N 4.05.

N-*Phenyl-2-(1-phenylpropen-1-yl)benzamide* (**5f**). A mixture of stereoisomers ((*E*)/(*Z*) *ca.* 6:4). A pale-yellow oil. R_f (THF/hexane 1:8) 0.40. IR (neat): 3306, 1661. ^{1}H-NMR (500 MHz): 1.71 (*d*, *J* = 7.3, 1.8 H); 1.91 (*d*, *J* = 7.3, 1.2 H); 6.07 (*q*, *J* = 7.3, 0.8 H); 6.49 (*q*, *J* = 7.3, 1.2 H); 7.03–7.57 (*m*, 12.4 H); 7.65 (*d*, *J* = 7.3, 0.4 H); 7.78 (br. *s*, 0.6 H); 8.00 (*dd*, *J* = 7.8, 1.4, 0.6 H). Anal. calc. for $C_{22}H_{19}NO$ (313.39): C 84.31, H 6.11, N 4.47; found: C 84.15, H 6.39, N 4.46.

*2,3-Dihydro-3,3-dimethyl-2-phenyl-1*H-*isoindol-1-one* (**3a**). *Typical Procedure.* To a stirred soln. of **2a** (0.15 g, 0.65 mmol) in MeCN (5 ml) at 0° was added dropwise conc. HI (0.31 g, 1.3 mmol). The mixture was stirred at r.t. overnight. The resulting mixture was diluted by adding Et_2O (15 ml), and sat. aq. $NaHCO_3$ (10 ml) was added. The layers were separated, and the aq. layer was extracted with Et_2O (2 × 5 ml). The combined extracts were washed with brine, dried (Na_2SO_4), and concentrated by evaporation. The residual solid was recrystallized from hexane/Et_2O to give pure **3a** (96 mg, 62%). White solid. M.p. 188–190° ([12]: 191–192.5°). The spectroscopic data (IR and ^{1}H-NMR) were identical to those reported in [1][12].

*2-(4-Chlorophenyl)-2,3-dihydro-3,3-dimethyl-1*H-*isoindol-1-one* (**3b**). White solid. M.p. 115–118° (hexane/Et_2O). IR (KBr): 1680. ^{1}H-NMR (400 MHz): 1.64 (*s*, 6 H); 7.26–7.32 (*m*, 5 H); 7.47 (*dd*, *J* = 8.1, 7.0, 1 H); 7.55 (*dd*, *J* = 7.7, 7.0, 1 H); 7.90 (*d*, *J* = 8.1, 1 H). ^{13}C-NMR: 27.79; 88.57; 120.68; 124.02; 125.10; 128.60; 128.71; 128.94; 129.98; 132.09; 145.35; 151.53; 158.23. MS: 271 (58, M^+), 256 (100). Anal. calc. for $C_{16}H_{14}ClNO$ (271.74): C 70.72, H 5.19, N 5.15; found: C 70.57, H 5.25, N 4.98.

*2,3-Dihydro-5-methoxy-3,3-dimethyl-2-phenyl-1*H-*isoindol-1-one* (**3c**). A pale-yellow solid. M.p. 91–94° (hexane/CH_2Cl_2). IR (KBr): 1674. ^{1}H-NMR (400 MHz): 1.62 (*s*, 6 H); 3.90 (*s*, 3 H); 6.75 (*d*, *J* = 2.3, 1 H); 7.00 (*dd*, *J* = 8.7, 2.3, 1 H); 7.08 (*tt*, *J* = 7.3, 1.4, 1 H); 7.30–7.35 (*m*, 4 H); 7.85 (*d*, *J* = 8.7, 1 H). ^{13}C-NMR: 27.74; 55.72; 87.57; 104.89; 115.42; 122.51; 123.56; 123.64; 125.49; 128.52; 146.96; 153.86; 157.76; 163.18. MS: 267 (62, M^+), 252 (100). Anal. calc. for $C_{17}H_{17}NO_2$ (267.32): C 76.38, H 6.41, N 5.24; found: C 76.09, H 6.48, N 5.18.

*2-(1,1-Dimethylethyl)-2,3-dihydro-5-methoxy-3,3-dimethyl-1*H-*isoindol-1-one* (**3d**). A pale-yellow oil. R_f (Et_2O/hexane 1:1) 0.25. IR (neat): 1690, 1613. ^{1}H-NMR (400 MHz): 1.38 (*s*, 9 H); 1.57 (*s*, 6 H); 3.86 (*s*, 3 H); 6.68 (*d*, *J* = 2.2, 1 H); 6.89 (*dd*, *J* = 8.4, 2.2, 1 H); 7.68 (*d*, *J* = 8.4, 1 H). ^{13}C-NMR: 27.86; 30.02; 53.25; 55.59; 85.89; 104.82; 114.70; 123.81; 124.98; 152.76; 155.85; 162.36. MS: 247 (69, M^+), 191 (100). Anal. calc. for $C_{15}H_{21}NO_2$ (247.33): C 72.84, H 8.56, N 5.66; found: C 72.64, H 8.54, N 5.61.

*2,3-Dihydro-5,6-dimethoxy-3,3-dimethyl-2-phenyl-1*H-*isoindol-1-one* (**3e**). A pale-yellow oil. R_f (THF/hexane 1:2) 0.45. IR (neat): 1674. ^{1}H-NMR (500 MHz): 1.62 (*s*, 6 H); 3.96 (*s*, 3 H); 3.98 (*s*, 3 H); 6.72 (*s*, 1 H); 7.09 (*t*, *J* = 7.3, 1 H); 7.29–7.37 (*m*, 5 H). ^{13}C-NMR: 27.76; 56.22; 56.28; 87.78; 102.07; 105.06; 119.56; 121.90; 123.58; 128.52; 145.30; 146.88; 150.10; 153.11; 158.31. MS: 297 (29, M^+), 282 (100). Anal. calc. for $C_{18}H_{19}NO_3$ (297.35): C 72.71, H 6.44, N 4.71; found: C 72.52, H 6.31, N 5.00.

*(*E*)-2,3-Dihydro-3-methyl-3-phenyl-1-(phenylimino)isobenzofuran* (**6a**). *Typical Procedure.* To a stirred soln. of **5a** (0.21 g, 0.71 mmol) in MeCN at 0° was added conc. HI (0.32 g, 1.4 mmol). The mixture was stirred for 1 h at the same temp. The precipitate was collected by filtration and recrystallized from hexane/Et_2O to give **6a** (0.18 g, 86%). White solid. M.p. 173–175°. IR (KBr): 1659. ^{1}H-NMR (500 MHz): 2.26 (*s*, 3 H); 7.34–7.36 (*m*, 2 H); 7.40–7.51 (*m*, 7 H); 7.81 (*dd*, *J* = 7.8, 7.3, 1 H); 7.92 (*dd*, *J* = 7.8, 7.3, 1 H); 8.08 (*d*, *J* = 7.8, 2 H); 9.98 (*d*, *J* = 7.8, 1 H). ^{13}C-NMR (125 MHz): 26.30; 102.41; 122.19; 123.21; 123.93; 125.49; 129.09; 129.40; 129.47; 130.22; 130.43; 130.97; 133.35; 136.12; 137.46; 152.12; 169.64. MS: 299 (100, M^+). Anal. calc. for $C_{21}H_{17}NO$ (299.37): C 84.25, H 5.72, N 4.68; found: C 84.11, H 5.79, N 4.69.

*(*E*)-1-[(4-Chlorophenyl)imino]-1,3-dihydro-3-methyl-3-phenylisobenzofuran* (**6b**). A pale-yellow solid. M.p. 125–128° (hexane/CH_2Cl_2). IR (KBr): 1663. ^{1}H-NMR (500 MHz): 2.24 (*s*, 3 H); 7.33–7.35

(*m*, 2 H); 7.43–7.47 (*m*, 5 H); 7.49 (*d*, *J* = 7.8, 1 H); 7.80 (*dd*, *J* = 7.8, 7.3, 1 H); 7.90 (*dd*, *J* = 7.8, 7.3, 1 H); 7.92 (*d*, *J* = 8.7, 2 H); 9.76 (distorted *d*, *J* = 7.8, 1 H). ^{13}C-NMR: 26.33; 102.37; 122.24; 125.33 (two overlapped C-atoms); 125.58; 127.60; 129.48; 129.71; 130.27; 130.35; 131.08; 134.83; 136.19; 137.46; 152.16; 170.89. MS: 333 (100, M^+). Anal. calc. for $C_{21}H_{16}ClNO$ (333.81): C 75.56, H 4.83, N 4.20; found: C 75.41, H 4.91, N 4.11.

*(*E*)-1-[(4-Bromophenyl)imino]-1,3-dihydro-3-methyl-3-phenylisobenzofuran* (**6c**). A pale-yellow solid. M.p. 180–183° (hexane/THF). IR (KBr): 1663. ^{1}H-NMR (500 MHz): 2.24 (*s*, 3 H); 7.33–7.35 (*m*, 2 H); 7.43–7.45 (*m*, 3 H); 7.49 (*d*, *J* = 7.3, 1 H); 7.59 (*d*, *J* = 8.7, 2 H); 7.79 (*dd*, *J* = 7.8, 7.3, 1 H); 7.84 (*d*, *J* = 8.7, 2 H); 7.90 (*t*, *J* = 7.3, 1 H); 9.70 (distorted *d*, *J* = 7.8, 1 H). ^{13}C-NMR: 26.55; 106.35; 122.66; 124.80; 124.84; 125.22; 125.44; 128.20; 128.75; 129.32; 129.50; 131.71; 132.50; 134.92; 140.98; 154.03; 169.14. MS: 377 (100, M^+). Anal. calc. for $C_{21}H_{16}BrNO$ (378.26): C 66.68, H 4.26, N 3.70; found: C 55.39, H 4.00, N 3.79.

*(*E*)-1-[(4-Chlorophenyl)imino]-1,3-dihydro-3-methyl-3-(4-methylphenyl)isobenzofuran* (**6d**). White solid. M.p. 121–124° (hexane/THF). IR (KBr): 1663. ^{1}H-NMR (500 MHz): 2.23 (*s*, 3 H); 2.37 (*s*, 3 H); 7.20 (*d*, *J* = 8.7, 2 H); 7.23 (*d*, *J* = 8.7, 2 H); 7.43 (*d*, *J* = 8.7, 2 H); 7.46 (*d*, *J* = 7.8, 1 H); 7.79 (*dd*, *J* = 7.8, 7.3, 1 H); 7.90 (*dd*, *J* = 7.8, 7.3, 1 H); 7.92 (*d*, *J* = 8.7, 2 H); 9.78 (distorted *d*, *J* = 7.8, 1 H). ^{13}C-NMR: 21.12; 26.08; 103.10; 122.25; 123.30; 125.28; 125.65; 129.63; 130.05; 130.27; 130.97; 131.99; 132.85; 134.84; 137.55; 140.77; 152.37; 169.63. MS: 347 (100, M^+). Anal. calc. for $C_{22}H_{18}ClNO$ (347.84): C 75.97, H 5.22, N 4.03; found: C 75.97, H 5.21, N 4.03.

*(*E*)-1,3-Dihydro-5-methoxy-3-methyl-3-phenyl-1-(phenylimino)isobenzofuran* (**6e**). A pale-yellow solid. M.p. 146–149° (hexane/THF). IR (KBr): 1668, 1603. ^{1}H-NMR (500 MHz): 2.22 (*s*, 3 H); 3.96 (*s*, 3 H); 6.84 (*d*, *J* = 2.3, 1 H); 7.26 (*dd*, *J* = 8.7, 2.3, 1 H); 7.33–7.38 (*m*, 3 H); 7.42–7.47 (*m*, 5 H); 7.96 (*d*, *J* = 7.8, 2 H); 9.85 (*d*, *J* = 8.7, 1 H). ^{13}C-NMR: 26.13; 56.53; 100.13; 107.18; 115.31; 117.34; 117.40; 123.65; 125.43; 128.24; 129.32; 129.96; 131.72; 134.62; 136.68; 153.23; 155.53; 167.14. MS: 329 (100, M^+). Anal. calc. for $C_{22}H_{19}NO_2$ (329.39): C 80.22, H 5.81, N 4.25; found: C 80.03, H 5.85, N 4.17.

*(*E*)-3-Ethyl-1,3-dihydro-3-phenyl-1-(phenylimino)isobenzofuran* (**6f**). A pale-yellow solid. M.p. 186–189° (hexane/THF). IR (KBr): 1665. ^{1}H-NMR (500 MHz): 0.85 (*t*, *J* = 7.3, 3 H); 2.48–2.56 (*m*, 1 H); 2.71–2.78 (*m*, 1 H); 7.37–7.46 (*m*, 6 H); 7.51 (*t*, *J* = 7.8, 2 H); 7.59 (*d*, *J* = 7.8, 1 H); 7.78 (*dd*, *J* = 7.8, 7.3, 1 H); 7.93 (*dd*, *J* = 7.8, 7.3, 1 H); 8.02 (*dd*, *J* = 7.8, 0.9, 2 H); 9.86 (*d*, *J* = 7.8, 1 H). ^{13}C-NMR: 8.11; 32.53; 105.12; 122.38; 123.87; 124.04; 125.23; 129.01; 129.38; 129.54; 129.85; 130.19; 130.90; 133.49; 136.12; 137.24; 150.47; 169.53. MS: 313 (100, M^+). Anal. calc. for $C_{22}H_{19}NO$ (313.39): C 84.31, H 6.11, N 4.47; found: C 84.07, H 6.30, N 4.47.

*3-Methyl-3-phenylisobenzofuran-1(3*H*)-one* (**7**) [13]. To a stirred soln. of **6a** (0.71 g, 0.24 mmol) in 1,2-dimethoxyethane (DME; 3 ml) at 0° was added 10% aq. HCl (0.71 ml). The mixture was then heated at reflux for 30 min. The cooled mixture was diluted with H_2O (10 ml) and extracted with Et_2O (2 × 7 ml). The combined extracts were washed with sat. aq. NH_4Cl and brine, and dried (Na_2SO_4). After evaporation of the solvent, the residual solid was purified by recrystallization from hexane/Et_2O to give **7** (42 mg, 79%). White solid. M.p. 76–77° ([13a]: 77–78°). The spectroscopic data (IR and ^{1}H-NMR) were identical to those reported in [13c].

We thank Mrs. *Miyuki Tanmatsu* of this university for recording mass spectra and performing combustion analyses.

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Received April 29, 2010