ChemPubSoc Europe

DOI: 10.1002/ejoc.201501399

EurJOC European Journal of Organic Chemistry

Full Paper

Modular Oxindole Synthesis

Modular Catalytic Synthesis of 3-Amino-3-aryl-2-oxindoles: Rh Catalysis with Isatin-Derived *N*-Boc-Protected Ketimines

Carolina S. Marques*[a] and Anthony J. Burke*[a,b]

Abstract: Chiral 3-amino-3-aryloxindoles are important biologically active compounds. Using a catalytic modular approach, 31 new 3-amino-3-aryl-2-oxindoles were prepared by a simple Rh-catalysed addition of arylboronic acids to isatin-derived *N*-Boc-protected ketimines (Boc = *tert*-butoxycarbonyl). A low catalyst loading of 3 mol-% was used, and the reaction showed a wide scope with high functional-group compatibility, and gave good yields. We report the first catalytic enantioselective reactions with this substrate. Deprotection of the Boc group was easily accomplished in good yields.

Introduction

The oxindole skeleton is a privileged framework that is found in a variety of natural products and biologically active compounds.[1a] 3,3-Disubstituted derivatives are particularly important,[1b] and 3-substituted-3-amino-2-oxindole frameworks (Figure 1) bearing a tetrasubstituted stereogenic centre at the 3-position are of considerable interest as promising drug candidates.[2]

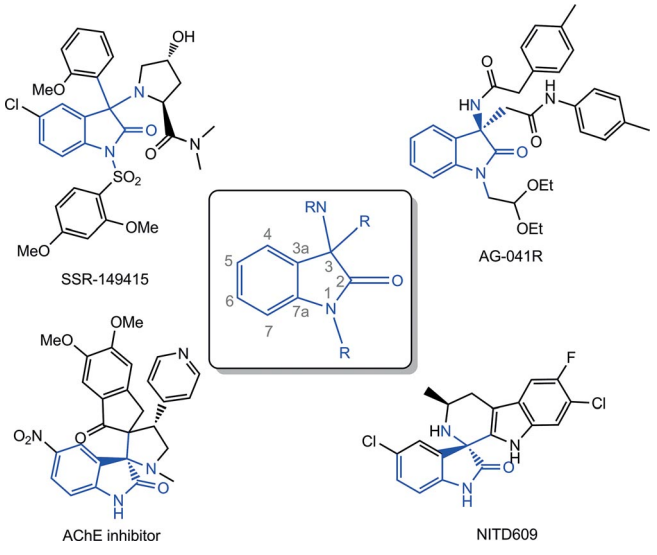


Figure 1. Some representative examples of biologically active 3-substituted 3-amino-2-oxindole derivatives.

Some examples include: SSR-149415 (Figure 1), an orally active nonpeptide vasopressin-receptor antagonist;[3] AG-041R, a gastrin/CCK-B-receptor antagonist also effective in the repair of cartilage defects;[4] an *N*-methyl-spiro[2.3′]oxindolespiro-[3.2′′]-5,6-dimethoxy-1′′-indanone-4-aryl-substituted pyrrolidine, which was identified as an acetylcholinesterase (AChE) inhibitor;[5] and NITD609 (Figure 1), an antimalarial drug candidate.[6] Thus the development of efficient methods to access these scaffolds is important. Several methods have been re-

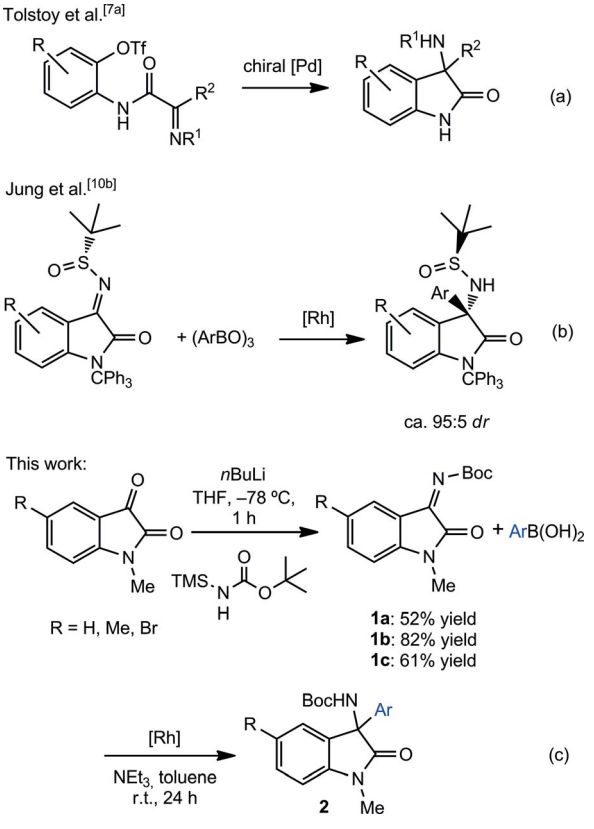


Figure 2. Some routes to 3-substituted 3-amino-2-oxindoles.

[a] *Centro de Química de Évora, University of Évora, Institute for Research and Advanced Training, CLAV, Rua Romão Ramalho 59, 7000 Évora, Portugal*

[b] *Department of Chemistry, School of Science and Technology, University of Évora, CLAV, Rua Romão Ramalho 59, 7000 Évora, Portugal*
E-mail: ajb@dquim.uevora.pt
carolsmarq@uevora.pt
http://www.burkegroup.uevora.pt/

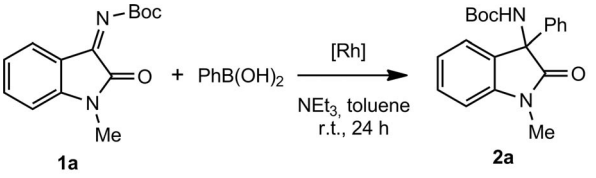
Supporting information and ORCID(s) from the author(s) for this article are available on the WWW under http://dx.doi.org/10.1002/ejoc.201501399.

ported to date.[2] One very convenient approach is through a transition-metal-catalysed cyclization onto activated imine groups. For example, Tolstoy et al.[7a] used a chiral Pd catalyst based on (*R*)-DiFluorPhos with α-ketimino amide substrates (Figure 2a), but this approach has the disadvantage that the synthesis of the imine substrate is difficult. In fact, as part of our research into the development of small-molecule AChE and butyrylcholinesterase (BuChE) inhibitors, using our experience in the area of catalytic arylations,[8] we have developed a cyclization method using in situ generated arylboronic ester *N*-*tert*-butanesulfinyl aldimines,[7b,7c] and these results will be reported in due course.

The other common approach to these targets is through a catalytic nucleophilic addition to isatin-ketimines.[9] This approach is also straightforward and powerful, considering the cheapness and availability of isatin (Figure 2b and c). The downside is that until now, toxic and environmentally unfriendly metals like Ti and Zn have been used in stoichiometric quantities. With this in mind, and prompted by a report from Ellman's group[10b] on the reaction of *N*-trityl-protected imine substrates with arylboroxines (Figure 2, b), we conducted a study using *N*-Boc protected isatin-ketimines (Figure 2, c). The improvements that our route gives over Ellman's lie in the fact that an expensive *tert*-butylsufinylamide group is not required, and neither is an arylboroxine required (these compounds have limited commercial availability). Thus our approach is more economically appealing. We also have demonstrated that the reaction has an enormous scope by the synthesis of 31 new 3-substituted 3-amino-2-oxindole derivatives.

Results and Discussion

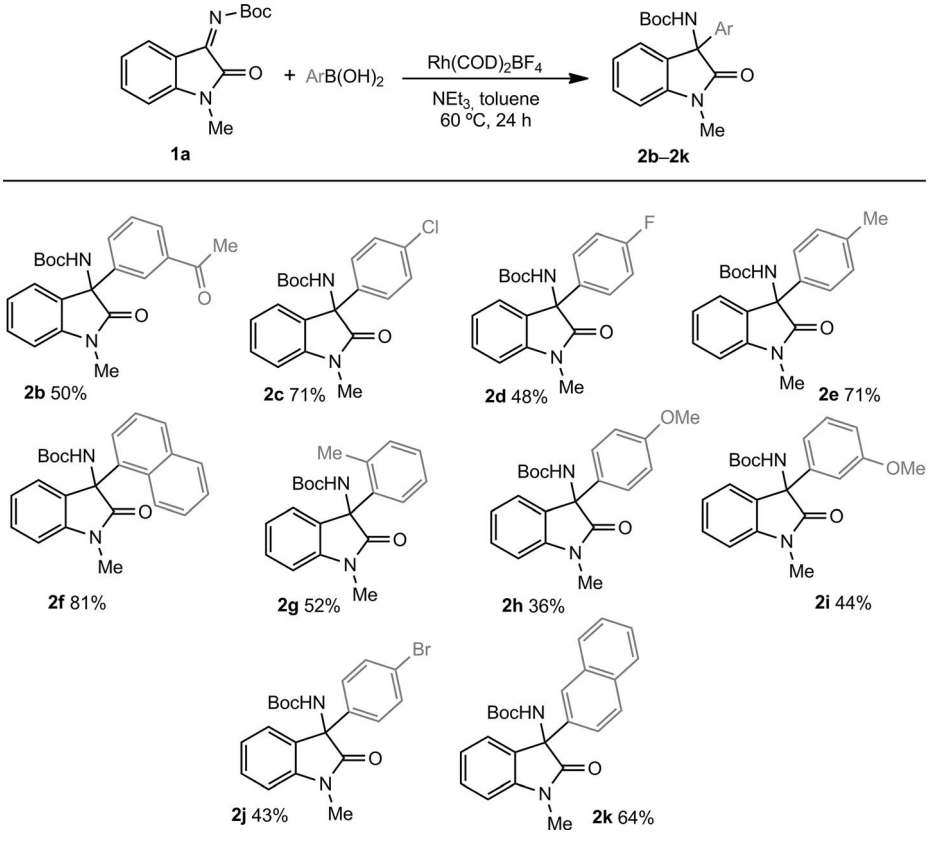
As a model reaction,[11] we attempted the addition of phenylboronic acid to ketimine **1a** using several commercially sourced Rh catalysts (Scheme 1).



[Rh]	Yield/%
$Rh(COD)_2BF_4$	73
$[Rh(COD)Cl]_2$	60
$[Rh(COD)OH]_2$	65

Scheme 1. Rh-catalysed addition of phenylboronic acid to ketimine **1a**.

Of all the catalysts tested, only $Rh(COD)_2BF_4$ (COD = 1,5-cyclooctadiene), $[Rh(COD)Cl]_2$, and $[Rh(COD)OH]_2$ gave the desired 3-amino-3-phenyl-2-oxindole (i.e., **2a**) in moderate to good yield (Scheme 1). The reaction failed when $[Rh(nbd)Cl]_2$ (nbd = norbornadiene), $[Rh(C_2H_4)_2Cl]_2$, Rh(acac)$(C_2H_4)_2$ (acac = acetylacetone), $[Rh(Cp^*)Cl_2]_2$, or $Rh_2(OAc)_4$ was used, which demon-



Scheme 2. Reaction of **1a** with arylboronic acids. Reaction conditions: ketimine **1a** (0.4 mmol), $ArB(OH)_2$ (0.8 mmol), $Rh(COD)_2BF_4$ (0.012 mmol, 3 mol-%), NEt_3 (0.8 mmol), toluene (2 mL), 60 °C, 24 h.

strates the importance of the 1,5-cyclooctadiene (COD) ligand. $[Ru(p\text{-cymene})Cl_2]_2$[8h] and $Pd(OAc)_2$/bpy (2,2′-bipyridine)[8i] catalysts were also tested in this arylation reaction, but only the $Pd(OAc)_2$/bpy system gave **2a** in 18 % yield. We then evaluated the scope of the reaction using a range of boronic acid derivatives bearing electron-donating and -withdrawing substituents with $Rh(COD)_2BF_4$ as catalyst. The results are shown in Scheme 2.

In general, moderate to good results were obtained, and good functional group tolerance was observed for the boronic acids. Both electron-deficient and -rich boronic acids were used successfully, which is consistent with previous reports on analogous systems.[10b,12] The best yield was achieved using 1-naphthylboronic acid (Scheme 2, compound **2f**, 81 % yield). Apparently the reaction yield improved when an electron-donating group was present (compounds **2e**, **2f**, **2k**, Scheme 2), with the exception of compound **2c** (71 % yield, Scheme 2), which contained a Cl atom. Steric effects were also noted, as the yield for the formation of **2e** was higher than that for **2g** (Scheme 2). The aliphatic boronic acids[13] methylboronic acid, 1-dodecylboronic acid, and ethylboronic acid were also tested in this catalytic transformation, but failed to give any product.

Due to the availability of the isatin derivatives 5-methylisatin and 5-bromoisatin, we decided to extend the scope of the reaction. We synthesized the corresponding ketimine derivatives (i.e., **1b** and **1c**, see Figure 2, c) and tested these compounds under the optimized conditions described above using the same range of boronic acid derivatives. The results are shown in Table 1.

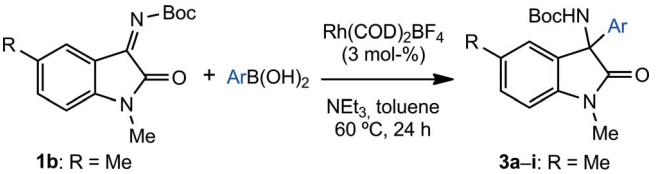
Using a commercially available Rh catalyst, 20 new compounds were synthesized (Table 1). When ketimine **1b** was used, owing to the electron-donating group (Me) in the 5-position of the phenyl ring, no product was obtained with 4-chloro- or 4-fluorophenylboronic acid. However, surprisingly, with 4-bromophenylboronic acid, **3i** was obtained in 49 % yield (Table 1, entry 9). Very good yields were obtained when arylboronic acid derivatives bearing electron-donating groups were used (see, for instance, Table 1, entries 3, 4, 6, and 7). Once again, due to steric effects, compound **3c** was obtained in a higher yield (80 %) than compound **3e** (44 %; Table 1, compare entries 3 and 5). The best yield using ketimine **1b** was obtained for compound **3g** (Table 1, entry 7).

When ketimine **1c** [with an electron-withdrawing substituent (Br) in the 5-position of the isatin phenyl ring] was used together with the various arylboronic acid reagents, no significant difference was observed in the yields of the products compared to when **1b** or **1a** was used. The best yield was obtained for compound **4a**, with no substituents on the aryl ring (Table 1, entry 10). Steric effects were again observed, since boron reagents bearing *para* substituents in the aryl ring gave better yields than their *ortho*-substituted analogues (Table 1, compare entries 14 and 16).

Encouraged by these results, we decided to evaluate the asymmetric version of this reaction. The preliminary results can be seen in Table 2.

Several commercially available chiral ligands were tested using different Rh precatalysts. In the first catalytic reaction, we tested chiral diene ligand **5**[11] (see Table 2, entry 1 and Supporting Information for structure information), and despite the fact the yield was only moderate, an encouraging enantioselectivity of 39 % *ee* was obtained. Such ligands have already

Table 1. Substrate scope in the Rh-catalysed arylation of isatin-derived ketimines **1b** and **1c** using arylboronic acids.



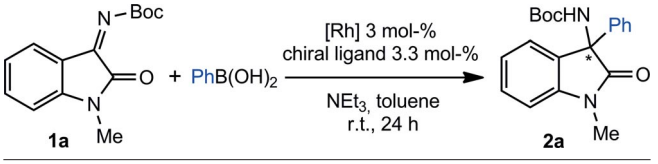
1b: R = Me
1c: R = Br

3a–i: R = Me
4a–k: R = Br

Entry[a]	Ketimine	Ar	Yield[b] [%]	Product **3** or **4**
1	**1b**	C_6H_5	74	**3a**
2	**1b**	3-AcC_6H_4	36	**3b**
3	**1b**	4-MeC_6H_4	80	**3c**
4	**1b**	1-naphthyl	71	**3d**
5	**1b**	2-MeC_6H_4	44	**3e**
6	**1b**	4-$MeOC_6H_4$	78	**3f**
7	**1b**	3-$MeOC_6H_4$	84	**3g**
8	**1b**	2-naphthyl	54	**3h**
9	**1b**	4-BrC_6H_4	49	**3i**
10	**1c**	C_6H_5	84	**4a**
11	**1c**	3-AcC_6H_4	63	**4b**
12	**1c**	4-ClC_6H_4	21	**4c**
13	**1c**	4-FC_6H_4	76	**4d**
14	**1c**	4-MeC_6H_4	72	**4e**
15	**1c**	1-naphthyl	25	**4f**
16	**1c**	2-MeC_6H_4	54	**4g**
17	**1c**	4-$MeOC_6H_4$	48	**4h**
18	**1c**	3-$MeOC_6H_4$	69	**4i**
19	**1c**	2-naphthyl	44	**4j**
20	**1c**	4-BrC_6H_4	71	**4k**

[a] Reaction conditions: ketimine **1** (0.4 mmol), $ArB(OH)_2$ (0.8 mmol), $Rh(COD)_2BF_4$ (0.012 mmol), NEt_3 (0.8 mmol), toluene (2 mL), 60 °C, 24 h. [b] Isolated yield.

Table 2. Rh-catalysed asymmetric arylation of ketimine **1a** with phenylboronic acid.



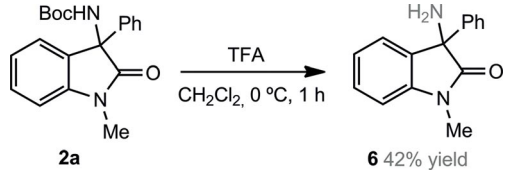
1a **2a**

Entry[a]	[Rh]	Chiral ligand	Yield[b] [%]	*ee*[c] [%]
1	$[RhCl(C_2H_4)_2]_2$	(*S*,*S*)-Diene **5**[d]	30	39
2	$[Rh(COD)OH]_2$	(*R*)-MonoPhos	70	<5
3	$[Rh(COD)OH]_2$	(*S*,*S*)-Diene **5**[d]	82	*rac*
4	$[Rh(COD)OH]_2$	(*R*)-BINAP	80	*rac*
5	$[Rh(COD)OH]_2$	(*R*,*R*)-ChiraPhos	68	<5
6	$Rh(acac)(C_2H_4)_2$	(*R*)-MOP	0	–
7	$Rh(COD)_2BF_4$	(*S*,*S*)-Diene **5**[d]	45	13

[a] Reaction conditions: ketimine **1a** (0.4 mmol), $PhB(OH)_2$ (0.8 mmol), [Rh] (0.012 mmol), chiral ligand (0.013 mmol), NEt_3 (0.8 mmol), toluene (2 mL), room temp., 24 h. [b] Isolated yield. [c] Determined by chiral stationary phase HPLC (see Supporting Information for further details). [d] See structure in Supporting Information; (*R*)-BINAP = (*R*)-2,2′-bis(diphenylphosphino)-1,1′-binaphthyl; (*R*,*R*)-ChiraPhos = (2*R*,3*R*)-2,3-bis(diphenylphosphino)butane; (*R*)-MOP = (*R*)-2-(diphenylphosphino)-2′-methoxy-1,1′-binaphthyl.

proved their applicability in other imine arylations.[11] When we screened $[Rh(COD)OH]_2$ (which gave good results in the non-asymmetric reaction, see Scheme 1) with a series of phosphane ligands [(*R*)-BINAP, (*R*,*R*)-ChiraPhos, and (*R*)-MonoPhos[14]], good yields were obtained, but the enantioselectivities were very poor. The combination of $[Rh(COD)OH]_2$ with diene ligand **5** was also unsuccessful in terms of the enantioselectivity (Table 2, entry 3). Following on from the work of the Hayashi group,[15] we tested the (*R*)-MOP ligand in combination with $Rh(acac)(C_2H_4)_2$ as a precatalyst, but unfortunately there was no reactivity whatsoever (Table 2, entry 6). $Rh(COD)_2BF_4$ was also tested together with chiral diene ligand **5** (Table 2, entry 7). Although the yield was better than that obtained with $[RhCl(C_2H_4)_2]_2$, the enantioselectivity was lower (13 % *ee*).

The Boc group[16] of **2a** was successfully deprotected to give the free amine (i.e., **6**) in 42 % yield (Scheme 3).



2a **6** 42% yield

Scheme 3. Deprotection of **2a** to give **6**; TFA = trifluoroacetic acid.

Conclusions

We have developed an efficient Rh-catalysed arylation of isatin-derived *N*-Boc ketimines to give important 3-aryl-3-amino-2-oxindoles using commercially available arylboronic acid derivatives. We also have reported the first asymmetric catalytic arylation – requiring no chiral auxiliary – of isatin-containing ketimines to give 3-amino-3-aryl-2-oxindoles. We are currently testing these compounds for AChE and BuChE inhibition.

Experimental Section

General Remarks: Reagents were obtained from Sigma–Aldrich and Acros, and were used as received. The solvents used were dried using current laboratory techniques.[17] Reactions with transition metals (Rh) were conducted in a Radley's® 12-position carousel reactor under a nitrogen atmosphere, and nonaqueous reactions and manipulations were carried out using standard Schlenk techniques. Column chromatography was carried out on silica gel (SDS, 70–200 mm). Thin-layer chromatography (TLC) was carried out on aluminium-backed Kieselgel 60 F254 plates (Merck). Plates were visualized either by UV light or with phosphomolybdic acid in ethanol. Melting points were determined with a Barnstead Electothermal 9100 apparatus. NMR spectra were recorded with a Bruker Avance III instrument (400 MHz). Chemical shifts are quoted in parts per million (ppm) relative to δ = 0.0 ppm for tetramethylsilane, and were referenced to the appropriate non-deuterated solvent peak. Coupling constants (*J*) are reported in Hz, and refer to apparent peak multiplicities. Splitting patterns are reported as s, singlet; d, doublet; t, triplet; m, multiplet; br., broad. Mass spectra (MS) were recorded with a Waters-Micromass instrument using the ESI-TOF technique. High-performance liquid chromatographic (HPLC) analysis was carried out with a Hitachi Primaide instrument, equipped with a 1410 series UV detector.

General Procedure for the Synthesis of Isatin-Derived *N*-Boc Ketimines 1a–c:[18] Butyllithium (2.5 M solution in hexane; 2.5 mL, 6.2 mmol) was added to a stirred solution of *tert*-butyl (trimethylsilyl)carbamate (see Supporting Information; 1.17 g, 6.2 mmol) in THF (10 mL) at –78 °C. The mixture was stirred for 1 h, then *N*-protected isatin (see Supporting Information; 6.2 mmol) in THF (10 mL) was added dropwise. The reaction mixture was stirred for a further 5 h, and then chlorotrimethylsilane (0.59 mL, 6.8 mmol) was added to the reaction mixture. The reaction mixture was then gradually warmed to room temperature over 2 h. The mixture was poured into saturated aqueous $NaHCO_3$, and extracted with ethyl acetate. The combined organic layers were dried with anhydrous $MgSO_4$, and concentrated under reduced pressure. The crude mixture was purified by column chromatography on silica gel using hexane/Et_2O (1:1) as eluent to give the product.

***tert*-Butyl (*Z*)-1-Methyl-2-oxoindolin-3-ylidenecarbamate (1a):** Yellow solid (0.82 g, 52 %).[18a] m.p. 98.4–99.7 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.62 (s, 9 H, CH_3), 3.21 (s, 3 H, CH_3), 6.82–6.84 (d, *J* = 8 Hz, 1 H, Ar), 7.07–7.11 (t, *J* = 8 Hz, 1 H, Ar), 7.47–7.50 (t, 1 H, Ar), 7.63–7.64 (m, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.2, 28.1, 83.6, 109.3, 119.5, 123.3, 123.6, 124.4, 129.9, 135.4, 148.2, 160.5 ppm.

***tert*-Butyl (*Z*)-1,5-Dimethyl-2-oxoindolin-3-ylidenecarbamate (1b):** Pale orange solid (1.43 g, 82 %).[18a] m.p. 123.5–125.0 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.62 (s, 9 H, CH_3), 2.30 (s, 3 H, CH_3), 3.17 (s, 3 H, CH_3), 6.70–6.72 (d, *J* = 8 Hz, 1 H, Ar), 7.26–7.28 (d, *J* = 8 Hz, 1 H, Ar), 7.42 (br. s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 20.9, 28.0, 29.7, 83.3, 109.1, 119.3, 124.7, 130.8, 133.2, 135.8, 145.9, 153.4, 160.6 ppm.

***tert*-Butyl (*Z*)-5-Bromo-1-methyl-2-oxoindolin-3-ylidenecarbamate (1c):** Orange solid (1.31 g, 61 %).[18b,18c] m.p. 155.0–155.9 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.60 (s, 9 H, CH_3), 3.17 (s, 3 H, CH_3), 6.72–6.74 (d, *J* = 8 Hz, 1 H, Ar), 7.56–7.58 (d, *J* = 8 Hz, 1 H, Ar), 7.68 (br. s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.3, 28.0, 83.8, 110.9, 116.2, 120.9, 127.0, 137.7, 146.8, 152.1, 156.7, 159.9 ppm.

General Procedure for the Rh-Catalysed Addition of Arylboronic Acids to Ketimines: In a Radley's® 12-position carousel reactor under a nitrogen atmosphere, $Rh(COD)_2BF_4$ (4.7 mg, 0.012 mmol, 3 mol-%), ketimine **1a**–**1c** (100 mg, 0.4 mmol), $ArB(OH)_2$ (0.8 mmol), NEt_3 (0.11 mL, 0.8 mmol), and toluene (2 mL) were mixed. The reaction mixture was stirred at 60 °C for 24 h. After that, the solvent was evaporated under reduced pressure. The crude product was purified by column chromatography on silica gel using hexane/Et_2O (1:1) as eluent to give the desired compounds.

***tert*-Butyl 1-Methyl-2-oxo-3-phenylindolin-3-ylcarbamate (2a):** White solid (0.114 g, 73 %). m.p. 120.9–122.1 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.19 (s, 3 H, CH_3), 5.49 (br. s, 1 H, NH), 6.86–6.88 (d, *J* = 8 Hz, 1 H, Ar), 7.12–7.16 (t, *J* = 8 Hz, 1 H, Ar), 7.29–7.30 (m, 3 H, Ar), 7.34–7.43 (m, 4 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.1, 64.9, 80.6, 108.4, 122.8, 124.5, 126.8, 128.9, 129.0, 129.2, 138.1, 144.0, 154.0, 175.9 ppm. HRMS (ESI): calcd. for $C_{20}H_{22}N_2O_3$ $[M]^+$ 339.16640; found 339.17068.

***tert*-Butyl 3-(3-Acetylphenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (2b):** Yellow solid (0.0754 g, 50 %). m.p. 118.0–119.7 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.28 (br. s, 9 H, CH_3), 2.55 (s, 3 H, CH_3), 3.20 (s, 3 H, CH_3), 5.45 (br. s, 1 H, NH), 6.89–6.91 (d, *J* = 8 Hz, 1 H, Ar), 7.16–7.19 (t, 1 H, Ar), 7.38–7.46 (m, 3 H, Ar), 7.59–7.61 (d, *J* = 8 Hz, 1 H, Ar), 7.88–7.90 (d, *J* = 8 Hz, 1 H, Ar), 8.02 (s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 26.9, 28.2, 64.7, 80.9, 108.7, 123.2, 124.8, 126.8, 128.7, 129.3, 129.6, 130.0, 131.5, 137.8, 138.9, 143.9, 154.0, 175.5, 197.7 ppm. MS (ESI-TOF): *m*/*z* = 381.18 $[M]^+$.

***tert*-Butyl 3-(4-Chlorophenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (2c):** White solid (0.1025 g, 71 %). m.p. 184.7–185.9 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.19 (s, 3 H, CH_3), 5.41 (br. s, 1 H, NH), 6.88–6.90 (d, *J* = 8 Hz, 1 H, Ar), 7.14–7.17 (t, 1 H, Ar), 7.28 (s, 2 H, Ar), 7.34–7.42 (m, 4 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.1, 64.4, 80.8, 108.6, 123.1, 124.7, 128.4, 129.1, 129.5, 130.1, 135.0, 136.6, 143.9, 153.9, 175.5 ppm. MS (ESI-TOF): *m*/*z* = 373.13 $[M]^+$.

***tert*-Butyl 3-(4-Fluorophenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (2d):** Pale orange solid (0.0793 g, 48 %). m.p. 147.0–148.1 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.19 (s, 3 H, CH_3), 5.37 (br. s, 1 H, NH), 6.87–6.89 (d, *J* = 8 Hz, 1 H, Ar), 6.97–7.01 (t, *J* = 8 Hz, 2 H, Ar), 7.14–7.18 (t, 1 H, Ar), 7.36–7.42 (m, 4 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.2, 64.3, 80.8, 108.6, 115.7, 115.9, 123.0, 124.6, 128.9, 129.0, 130.1, 129.5, 133.8, 144.0, 153.9, 161.8, 164.3, 175.8 ppm. MS (ESI-TOF): *m*/*z* = 357.16 $[M]^+$.

***tert*-Butyl 1-Methyl-2-oxo-3-(*p*-tolyl)indolin-3-ylcarbamate (2e):** White solid (0.0961 g, 71 %). m.p. 167.0–168.1 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.30 (s, 3 H, CH_3), 3.18 (s, 3 H, CH_3), 5.39 (br. s, 1 H, NH), 6.85–6.87 (d, *J* = 8 Hz, 1 H, Ar), 7.10–7.15 (m, 3 H, Ar), 7.28–7.30 (d, *J* = 8 Hz, 2 H, Ar), 7.34–7.38 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.1, 26.7, 28.1, 64.7, 80.5, 108.3, 122.8, 124.4, 126.7, 129.2, 129.6, 135.1, 138.8, 144.0, 154.0, 176.1 ppm. MS (ESI-TOF): *m*/*z* = 353.19 $[M]^+$.

***tert*-Butyl 1-Methyl-3-(naphthalen-1-yl)-2-oxoindolin-3-ylcarbamate (2f):** White solid (0.1215 g, 81 %). m.p. 105.3–106.0 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.19 (s, 3 H, CH_3), 5.74 (br. s, 1 H, NH), 6.89–6.91 (d, *J* = 8 Hz, 1 H, Ar), 6.99–7.01 (d, *J* = 8 Hz, 1 H, Ar), 7.14–7.22 (m, 2 H, Ar), 7.37–7.41 (m, 2 H, Ar), 7.51–7.55 (t, *J* = 8 Hz, 1 H, Ar), 7.64–7.68 (t, *J* = 8 Hz, 1 H, Ar), 7.78–7.80 (d, *J* = 8 Hz, 1 H, Ar), 7.85–7.87 (d, *J* = 8 Hz, 1 H, Ar), 9.33–9.35 (m, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 28.1, 67.6, 80.5, 108.3, 122.9, 124.6, 124.7, 126.1, 126.3, 126.6, 127.8, 129.2, 129.3, 130.6, 131.0, 133.4, 135.3, 143.9, 153.7, 175.9 ppm. MS (ESI-TOF): *m*/*z* = 389.19 $[M]^+$.

***tert*-Butyl 1-Methyl-2-oxo-3-(*o*-tolyl)indolin-3-ylcarbamate (2g):** White solid (0.0756 g, 52 %). m.p. 106.9–108.0 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.59 (br. s, 3 H, CH_3), 3.20 (s, 3 H, CH_3), 5.52 (br. s, 1 H, NH), 6.85–6.87 (d, *J* = 8 Hz, 1 H, Ar), 6.94–6.96 (d, *J* = 8 Hz, 1 H, Ar), 7.03–7.05 (m, 1 H, Ar), 7.09–7.13 (t, 1 H, Ar), 7.17–7.18 (m, 2 H, Ar), 7.33–7.36 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.7, 28.2, 28.3, 66.3, 80.5, 108.2, 123.0, 126.0, 127.8, 128.6, 129.2, 133.5, 135.9, 137.3, 137.6, 144.0, 154.0, 176.0 ppm. MS (ESI-TOF): *m*/*z* = 353.19 $[M]^+$.

***tert*-Butyl 3-(4-Methoxyphenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (2h):** Yellow solid (0.0567 g, 36 %). m.p. 127.1–128.2 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.17 (s, 3 H, CH_3), 3.74 (s, 3 H, OCH_3), 5.44 (br. s, 1 H, NH), 6.80–6.87 (m, 3 H, Ar), 7.11–7.15 (t, *J* = 8 Hz, 1 H, Ar), 7.33–7.39 (m, 4 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.6, 28.1, 55.3, 64.3, 80.4, 108.3, 114.2, 122.7, 124.4, 128.2, 129.1, 129.9, 143.9, 153.9, 160.0, 176.1 ppm. MS (ESI-TOF): *m*/*z* = 369.18 $[M]^+$.

***tert*-Butyl 3-(3-Methoxyphenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (2i):** Yellow solid (0.0765 g, 44 %). m.p. 127.5–128.6 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.18 (s, 3 H, CH_3), 3.75 (s, 3 H, OCH_3), 5.53 (br. s, 1 H, NH), 6.81–6.87 (m, 2 H, Ar), 6.94–6.96 (d, *J* = 8 Hz, 1 H, Ar), 7.00 (s, 1 H, Ar), 7.11–7.15 (t, *J* = 8 Hz, 1 H, Ar), 7.17–7.21 (t, *J* = 8 Hz, 1 H, Ar), 7.33–7.39 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.7, 28.1, 55.3, 64.8, 80.5, 108.3, 112.8, 119.0, 122.8, 124.4, 129.2, 129.8, 130.5, 139.6, 143.9, 153.9, 159.9, 175.8 ppm. MS (ESI-TOF): *m*/*z* = 369.18 $[M]^+$.

***tert*-Butyl 3-(4-Bromophenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (2j):** Yellow solid (0.0669 g, 43 %). m.p. 187.4–188.7 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.18 (s, 3 H, CH_3), 5.51 (br. s, 1 H, NH), 6.87–6.89 (d, *J* = 8 Hz, 1 H, Ar), 7.13–7.17 (t, *J* = 8 Hz, 1 H, Ar), 7.27–7.29 (d, *J* = 8 Hz, 2 H, Ar), 7.36–7.43 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.1, 64.4, 80.7, 108.5, 123.0, 123.2, 124.7, 128.7, 129.5, 130.0, 132.0, 137.1, 143.9, 153.9, 175.4 ppm. MS (ESI-TOF): *m*/*z* = 419.08 $[M]^+$.

***tert*-Butyl 1-Methyl-3-(naphthalen-2-yl)-2-oxoindolin-3-ylcarbamate (2k):** White solid (0.1059 g, 64 %). m.p. 88.9–90.1 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.19 (s, 3 H, CH_3), 5.80 (br. s, 1 H, NH), 6.89–6.90 (d, *J* = 4 Hz, 1 H, Ar), 7.16–7.20 (t, *J* = 8 Hz, 1 H, Ar), 7.37–7.47 (m, 4 H, Ar), 7.69–7.81 (m, 5 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.7, 28.2, 65.0, 79.5, 108.4, 122.9, 124.2, 124.5, 126.2, 126.4, 126.7, 127.5, 128.4, 128.9, 129.2, 132.9, 133.2, 135.2, 144.0, 154.1, 156.5, 175.9 ppm. MS (ESI-TOF): *m*/*z* = 389.19 $[M]^+$.

***tert*-Butyl 1,5-Dimethyl-2-oxo-3-phenylindolin-3-ylcarbamate (3a):** White solid (0.1034 g, 74 %). m.p. 75.1–76.3 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.37 (s, 3 H, CH_3), 3.17 (s, 3 H, CH_3), 5.43 (br. s, 1 H, NH), 6.75–6.77 (d, *J* = 8 Hz, 1 H, Ar), 7.15–7.16 (d, *J* = 4 Hz, 1 H, Ar), 7.21 (s, 1 H, Ar), 7.29–7.31 (m, 3 H, Ar), 7.40–7.42 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.3, 26.8, 28.2, 65.0, 80.5, 108.1, 125.3, 126.8, 128.8, 128.9, 129.5, 130.5, 132.4, 138.3, 141.6, 154.0, 175.9 ppm. MS (ESI-TOF): *m*/*z* = 353.19 $[M]^+$.

***tert*-Butyl 3-(3-Acetylphenyl)-1,5-dimethyl-2-oxoindolin-3-ylcarbamate (3b):** White solid (0.0493 g, 36 %). m.p. 165.2–166.5 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.28 (br. s, 9 H, CH_3), 2.40 (s, 3 H, CH_3), 2.58 (s, 3 H, CH_3), 3.20 (s, 3 H, CH_3), 5.62 (br. s, 1 H, NH), 6.80–6.82 (d, *J* = 8 Hz, 1 H, Ar), 7.20–7.22 (d, *J* = 8 Hz, 1 H, Ar), 7.30 (s, 1 H, Ar), 7.40–7.44 (t, *J* = 8 Hz, 1 H, Ar), 7.57–7.59 (d, *J* = 8 Hz, 1 H, Ar), 7.90–7.92 (d, *J* = 8 Hz, 1 H, Ar), 8.07 (s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.3, 26.7, 26.8, 28.1, 64.8, 80.7, 108.3, 125.5, 126.7, 128.6, 129.1, 129.8, 130.1, 131.4, 132.8, 137.7, 139.0, 141.5, 154.1, 175.4, 197.7 ppm. MS (ESI-TOF): *m*/*z* = 395.20 $[M]^+$.

***tert*-Butyl 1,5-Dimethyl-2-oxo-3-(*p*-tolyl)indolin-3-ylcarbamate (3c):** Pale yellow solid (0.1026 g, 80 %). m.p. 139.2–141.3 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.30 (s, 3 H, CH_3), 2.37 (s, 3 H, CH_3), 3.16 (s, 3 H, CH_3), 5.40 (br. s, 1 H, NH), 6.74–6.76 (d, *J* = 8 Hz, 1 H, Ar), 7.10–7.12 (d, *J* = 8 Hz, 2 H, Ar), 7.13–7.15 (d, *J* = 8 Hz, 1 H, Ar), 7.19 (s, 1 H, Ar), 7.28–7.30 (d, *J* = 8 Hz, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.1, 21.3, 26.8, 28.2, 64.8, 80.5, 108.1, 125.2, 126.6, 129.4, 129.6, 130.8, 132.3, 135.3, 138.7, 141.6, 154.0, 176.0 ppm. MS (ESI-TOF): *m*/*z* = 367.20 $[M]^+$.

***tert*-Butyl 1,5-Dimethyl-3-(naphthalen-1-yl)-2-oxoindolin-3-ylcarbamate (3d):** Pale orange solid (0.1046 g, 71 %). m.p. 156.3–157.8 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.38 (s, 3 H, CH_3), 3.17 (s, 3 H, CH_3), 5.70 (br. s, 1 H, NH), 6.77–6.79 (d, *J* = 8 Hz, 1 H, Ar), 7.00–7.01 (d, *J* = 4 Hz, 1 H, Ar), 7.18–7.23 (m, 3 H, Ar), 7.51–7.55 (t, *J* = 8 Hz, 1 H, Ar), 7.64–7.68 (t, *J* = 8 Hz, 1 H, Ar), 7.78–7.80 (d, *J* = 8 Hz, 1 H, Ar), 7.85–7.87 (d, *J* = 8 Hz, 1 H, Ar), 9.33–9.35 (d, *J* = 8 Hz, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.3, 26.8, 28.2, 67.6, 80.7, 108.1, 124.7, 125.4, 126.0, 126.2, 126.6, 129.2, 128.5, 130.6, 131.0, 131.6, 132.4, 133.6, 135.3, 141.5, 153.8, 175.9 ppm. MS (ESI-TOF): *m*/*z* = 403.20 $[M]^+$.

***tert*-Butyl 1,5-Dimethyl-2-oxo-3-(*o*-tolyl)indolin-3-ylcarbamate (3e):** Pale yellow solid (0.0578 g, 44 %). m.p. 123.0–124.3 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.29 (br. s, 9 H, CH_3), 2.34 (s, 3 H, CH_3), 2.59 (s, 3 H, CH_3), 3.17 (s, 3 H, CH_3), 5.52 (br. s, 1 H, NH), 6.74–6.76 (d, *J* = 8 Hz, 1 H, Ar), 6.96–6.98 (d, *J* = 8 Hz, 1 H, Ar), 7.03–7.07 (m, 1 H, Ar), 7.14–7.18 (m, 4 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.3,

21.5, 26.6, 28.2, 66.4, 80.4, 107.9, 126.0, 127.8, 128.5, 129.4, 131.3, 132.5, 133.4, 136.1, 137.6, 141.6, 154.0, 175.9 ppm.

***tert*-Butyl 3-(4-Methoxyphenyl)-1,5-dimethyl-2-oxoindolin-3-ylcarbamate (3f):** Yellow solid (0.1144 g, 78 %). m.p. 165.9–167.4 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.25 (br. s, 9 H, CH_3), 2.37 (s, 3 H, CH_3), 3.15 (s, 3 H, CH_3), 3.76 (s, 3 H, OCH_3), 5.37 (br. s, 1 H, NH), 6.74–6.75 (d, *J* = 4 Hz, 1 H, Ar), 6.81–6.83 (d, *J* = 8 Hz, 2 H, Ar), 7.13–7.15 (d, *J* = 8 Hz, 1 H, Ar), 7.20 (s, 1 H, Ar), 7.33–7.35 (d, *J* = 8 Hz, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.3, 26.7, 28.1, 55.4, 64.4, 80.5, 108.1, 114.2, 125.2, 128.2, 129.4, 130.1, 132.3, 141.5, 154.0, 159.9, 176.1 ppm. MS (ESI-TOF): *m/z* = 383.20 $[M]^+$.

***tert*-Butyl 3-(3-Methoxyphenyl)-1,5-dimethyl-2-oxoindolin-3-ylcarbamate (3g):** White solid (0.1171 g, 84 %). m.p. 137.0–138.3 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.35 (s, 3 H, CH_3), 3.15 (s, 3 H, CH_3), 3.74 (s, 3 H, OCH_3), 5.55 (br. s, 1 H, NH), 6.73–6.75 (d, *J* = 8 Hz, 1 H, Ar), 6.80–6.82 (d, *J* = 8 Hz, 1 H, Ar), 6.93–6.95 (d, *J* = 8 Hz, 1 H, Ar), 7.00 (s, 1 H, Ar), 7.12–7.14 (d, *J* = 8 Hz, 1 H, Ar), 7.17–7.20 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.2, 26.7, 28.0, 55.2, 64.9, 80.4, 108.0, 112.8, 113.9, 118.9, 125.1, 129.4, 129.7, 130.5, 132.3, 139.7, 141.5, 154.0, 159.8, 175.7 ppm.

***tert*-Butyl 1,5-Dimethyl-3-(naphthalen-2-yl)-2-oxoindolin-3-ylcarbamate (3h):** Yellow solid (0.0813 g, 54 %). m.p. 74.5–75.6 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.29 (br. s, 9 H, CH_3), 2.40 (s, 3 H, CH_3), 3.19 (s, 3 H, CH_3), 5.54 (br. s, 1 H, NH), 6.79–6.81 (d, *J* = 8 Hz, 1 H, Ar), 7.18–7.20 (d, *J* = 8 Hz, 1 H, Ar), 7.28 (s, 1 H, Ar), 7.43–7.48 (m, 2 H, Ar), 7.66–7.83 (m, 5 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.4, 26.8, 28.2, 65.2, 80.6, 108.2, 124.1, 125.4, 126.1, 126.5, 126.7, 127.6, 128.4, 129.0, 129.6, 130.7, 132.5, 133.0, 133.3, 135.5, 141.6, 154.1, 175.8 ppm.

***tert*-Butyl 3-(4-Bromophenyl)-1,5-dimethyl-2-oxoindolin-3-ylcarbamate (3i):** White solid (0.0836 g, 49 %). m.p. 69.6–70.4 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.25 (br. s, 9 H, CH_3), 2.36 (s, 3 H, CH_3), 3.14 (s, 3 H, CH_3), 5.57 (br. s, 1 H, NH), 6.75–6.77 (d, *J* = 8 Hz, 1 H, Ar), 7.15–7.17 (d, *J* = 8 Hz, 1 H, Ar), 7.22 (s, 1 H, Ar), 7.26–7.28 (d, *J* = 8 Hz, 2 H, Ar), 7.39–7.41 (d, *J* = 8 Hz, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.2, 26.8, 28.1, 64.5, 80.7, 108.2, 123.1, 125.4, 128.6, 129.7, 130.1, 131.9, 132.6, 137.3, 141.5, 154.0, 175.3 ppm. MS (ESI-TOF): *m/z* = 431.10 $[M]^+$.

***tert*-Butyl 5-Bromo-1-methyl-2-oxo-3-phenylindolin-3-ylcarbamate (4a):** White solid (0.1431 g, 84 %). m.p. 160.3–161.6 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.17 (s, 3 H, CH_3), 5.49 (br. s, 1 H, NH), 6.74–6.76 (d, *J* = 8 Hz, 1 H, Ar), 7.31–7.33 (m, 3 H, Ar), 7.38–7.41 (m, 2 H, Ar), 7.47–7.50 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.9, 28.2, 64.8, 80.9, 109.9, 115.5, 126.6, 127.6, 129.1, 129.2, 132.0, 132.6, 137.4, 143.0, 153.8, 175.4 ppm. MS (ESI-TOF): *m/z* = 417.08 $[M]^+$.

***tert*-Butyl 3-(3-Acetylphenyl)-5-bromo-1-methyl-2-oxoindolin-3-ylcarbamate (4b):** Pale yellow solid (0.0941 g, 63 %). m.p. 113.0–114.6 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 2.53 (s, 3 H, CH_3), 3.15 (s, 3 H, CH_3), 5.74 (br. s, 1 H, NH), 6.75–6.77 (d, *J* = 8 Hz, 1 H, Ar), 7.36–7.40 (t, *J* = 8 Hz, 1 H, Ar), 7.47–7.53 (m, 3 H, Ar), 7.86–7.87 (d, *J* = 4 Hz, 1 H, Ar), 8.01 (s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.7, 26.8, 28.1, 64.6, 81.0, 110.1, 115.7, 126.5, 127.7, 128.8, 129.3, 131.2, 132.1, 132.3, 137.8, 138.1, 142.9, 153.9, 175.0, 197.4 ppm. MS (ESI-TOF): *m/z* = 459.09 $[M]^+$.

***tert*-Butyl 5-Bromo-3-(4-chlorophenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (4c):** White solid (0.0295 g, 21 %). m.p. 138.6–139.2 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.30 (br. s, 9 H, CH_3), 3.17 (s, 3 H, CH_3), 5.45 (br. s, 1 H, NH), 6.76–6.78 (d, *J* = 8 Hz, 1 H, Ar), 7.28–7.35 (m, 4 H, Ar), 7.49–7.52 (d, *J* = 12 Hz, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.9, 28.2, 64.3, 81.2, 110.12, 115.7, 127.7, 128.4, 129.3, 132.1, 132.4, 135.3, 135.8, 143.0, 153.8, 175.0 ppm. MS (ESI-TOF): *m/z* = 453.04 $[M]^+$.

***tert*-Butyl 5-Bromo-3-(4-fluorophenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (4d):** White solid (0.1029 g, 76 %). m.p. 188.4–189.5 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.27 (br. s, 9 H, CH_3), 3.15 (s, 3 H, CH_3), 5.62 (br. s, 1 H, NH), 6.75–6.77 (d, *J* = 8 Hz, 1 H, Ar), 6.97–7.01 (t, *J* = 8 Hz, 2 H, Ar), 7.37–7.40 (m, 2 H, Ar), 7.48–7.50 (d, *J* = 8 Hz, 1 H, Ar), 7.51 (s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.1, 64.2, 81.0, 110.0, 115.5, 115.8, 116.0, 127.6, 128.7, 128.8, 132.2, 133.0, 134.0, 143.0, 153.8, 161.8, 164.3, 175.2 ppm. MS (ESI-TOF): *m/z* = 435.07 $[M]^+$.

***tert*-Butyl 5-Bromo-1-methyl-2-oxo-3-(*p*-tolyl)indolin-3-ylcarbamate (4e):** Yellow solid (0.092 g, 72 %). m.p. 149.8–151.0 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.28 (br. s, 9 H, CH_3), 2.30 (s, 3 H, CH_3), 3.16 (s, 3 H, CH_3), 5.54 (br. s, 1 H, NH), 6.73–6.75 (d, *J* = 8 Hz, 1 H, Ar), 7.11–7.13 (d, *J* = 8 Hz, 2 H, Ar), 7.26–7.28 (d, *J* = 8 Hz, 2 H, Ar), 7.46–7.49 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.0, 26.8, 28.1, 64.6, 80.8, 109.8, 115.4, 126.5, 127.4, 129.7, 131.9, 132.7, 134.3, 139.1, 143.0, 153.8, 175.5 ppm.

***tert*-Butyl 5-Bromo-1-methyl-3-(naphthalen-1-yl)-2-oxoindolin-3-ylcarbamate (4f):** White solid (0.0382 g, 25 %). m.p. 85.2–86.9 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.30 (br. s, 9 H, CH_3), 3.18 (s, 3 H, CH_3), 5.77 (br. s, 1 H, NH), 6.77–6.79 (d, *J* = 8 Hz, 1 H, Ar), 6.98–7.00 (d, *J* = 8 Hz, 1 H, Ar), 7.22–7.24 (d, *J* = 8 Hz, 1 H, Ar), 7.51–7.56 (m, 3 H, Ar), 7.65–7.69 (t, *J* = 8 Hz, 1 H, Ar), 7.81–7.83 (d, *J* = 8 Hz, 1 H, Ar), 7.87–7.89 (d, *J* = 8 Hz, 1 H, Ar), 9.27–9.28 (d, *J* = 4 Hz, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.7, 28.1, 67.3, 80.9, 109.7, 115.3, 124.6, 126.1, 126.3, 126.4, 127.6, 129.2, 130.7, 132.0, 132.6, 133.5, 135.2, 142.9, 153.6, 175.3 ppm. MS (ESI-TOF): *m/z* = 467.10 $[M]^+$.

***tert*-Butyl 5-Bromo-1-methyl-2-oxo-3-(*o*-tolyl)indolin-3-ylcarbamate (4g):** White solid (0.0682 g, 54 %). m.p. 177.9–179.1 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.31 (br. s, 9 H, CH_3), 2.60 (s, 3 H, CH_3), 3.17 (s, 3 H, CH_3), 5.58 (br. s, 1 H, NH), 6.73–6.75 (d, *J* = 8 Hz, 1 H, Ar), 6.92–6.94 (d, *J* = 8 Hz, 1 H, Ar), 7.05–7.07 (m, 1 H, Ar), 7.18–7.19 (d, *J* = 4 Hz, 2 H, Ar), 7.45 (s, 1 H, Ar), 7.46–7.48 (d, *J* = 8 Hz, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 21.5, 26.7, 28.2, 66.2, 80.8, 109.6, 115.6, 126.2, 127.6, 128.2, 128.8, 132.0, 133.3, 133.6, 135.2, 137.5, 143.0, 153.8, 175.4 ppm. MS (ESI-TOF): *m/z* = 431.10 $[M]^+$.

***tert*-Butyl 5-Bromo-3-(4-methoxyphenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (4h):** Pale yellow solid (0.0604 g, 48 %). m.p. 151.8–153.0 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.29 (br. s, 9 H, CH_3), 3.15 (s, 3 H, CH_3), 3.75 (s, 3 H, OCH_3), 5.45 (br. s, 1 H, NH), 6.73–6.75 (d, *J* = 8 Hz, 1 H, Ar), 6.82–6.84 (d, *J* = 8 Hz, 2 H, Ar), 7.31–7.33 (d, *J* = 8 Hz, 2 H, Ar), 7.46–7.49 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.1, 55.4, 64.2, 80.8, 109.8, 114.4, 115.3, 127.4, 128.1, 129.1, 131.9, 143.0, 153.8, 160.1, 175.6 ppm. MS (ESI-TOF): *m/z* = 447.09 $[M]^+$.

***tert*-Butyl 5-Bromo-3-(3-methoxyphenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (4i):** Pale yellow solid (0.0875 g, 69 %). m.p. 83.5–84.3 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.25 (br. s, 9 H, CH_3), 3.16 (s, 3 H, CH_3), 3.76 (s, 3 H, OCH_3), 5.55 (br. s, 1 H, NH), 6.73–6.75 (d, *J* = 8 Hz, 1 H, Ar), 6.83–6.85 (d, *J* = 8 Hz, 1 H, Ar), 6.90–6.92 (d, *J* = 8 Hz, 1 H, Ar), 6.97 (s, 1 H, Ar), 7.19–7.23 (t, *J* = 8 Hz, 1 H, Ar), 7.45–7.49 (m, 2 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 28.1, 55.4, 64.7, 80.9, 109.8, 112.7, 114.2, 115.4, 118.8, 127.5, 130.0, 132.0, 132.6, 138.8, 143.0, 153.8, 160.0, 175.3 ppm.

***tert*-Butyl 5-Bromo-1-methyl-3-(naphthalen-2-yl)-2-oxoindolin-3-ylcarbamate (4j):** Pale yellow solid (0.0462 g, 44 %). m.p. 70.6–72.0 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.19 (s, 3 H, CH_3), 5.62 (br. s, 1 H, NH), 6.78–6.80 (d, *J* = 8 Hz, 1 H, Ar), 7.46–

7.48 (m, 2 H, Ar), 7.51–7.54 (d, J = 12 Hz, 1 H, Ar), 7.58 (s, 1 H, Ar), 7.64–7.67 (d, J = 12 Hz, 1 H, Ar), 7.69 (s, 1 H, Ar), 7.76–7.81 (m, 2 H, Ar), 7.83–7.85 (d, J = 8 Hz, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.9, 28.2, 65.0, 81.0, 110.0, 115.5, 123.8, 126.1, 126.7, 127.0, 127.6, 128.4, 129.2, 132.2, 132.6, 133.0, 133.3, 134.5, 143.1, 153.9, 175.4 ppm.

***tert*-Butyl 5-Bromo-3-(4-bromophenyl)-1-methyl-2-oxoindolin-3-ylcarbamate (4k):** White solid (0.1205 g, 71 %). m.p. 166.0–168.1 °C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 1.26 (br. s, 9 H, CH_3), 3.34 (s, 3 H, CH_3), 5.65 (br. s, 1 H, NH), 6.74–6.76 (d, J = 8 Hz, 1 H, Ar), 7.24–7.26 (d, J = 8 Hz, 2 H, Ar), 7.40–7.43 (d, J = 12 Hz, 2 H, Ar), 7.47–7.49 (d, J = 8 Hz, 1 H, Ar), 7.51 (s, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.9, 28.1, 64.4, 81.1, 110.0, 115.6, 123.4, 127.6, 128.5, 132.1, 132.3, 136.3, 142.9, 153.8, 174.9 ppm. MS (ESI-TOF): m/z = 496.99 $[M]^+$.

3-Amino-1-methyl-3-phenylindolin-2-one (6): *tert*-Butyl 1-methyl-2-oxo-3-phenylindolin-3-ylcarbamate (**2a**; 0.114 g, 0.34 mmol) was put into a round-bottomed flask containing a stirrer bar under air. CH_2Cl_2 (2 mL) was added to the flask, and the mixture was cooled to 0 °C. TFA (0.1 mL, 1.3 mmol) was added, and the mixture was stirred for 1 h at 0 °C. The reaction mixture was concentrated under reduced pressure. The resulting crude mixture was purified by silica gel column chromatography to give 3-amino-1-methyl-3-phenylindolin-2-one (**6**; 0.0335 g, 42 %) as an orange oil. ^{1}H NMR ($CDCl_3$, 400 MHz): δ = 3.16 (s, 3 H, CH_3), 6.37 (br. s, 2 H, NH_2), 6.89–6.91 (d, J = 8 Hz, 1 H, Ar), 7.08–7.12 (t, J = 8 Hz, 1 H, Ar), 7.30 (m, 3 H, Ar), 7.36–7.40 (m, 3 H, Ar), 7.45–7.47 (d, J = 8 Hz, 1 H, Ar) ppm. ^{13}C NMR ($CDCl_3$, 100 MHz): δ = 26.8, 63.3, 109.2, 124.0, 125.8, 126.1, 128.3, 129.0, 129.1, 130.6, 136.0, 143.5, 175.5 ppm. MS (ESI-TOF): m/z = 222.09 $[M - NH_2]^+$, 261.10 $[M + Na]^+$.

Acknowledgments

The authors gratefully acknowledge Fundo Europeu de Desenvolvimento Regional (FEDER-INALENTEJO) for funding the program INMOLFARM – Molecular Innovation and Drug Discovery (ALENT-07-0224-FEDER-001743) and for financing the acquisition of the NMR equipment, project LADECA (ALENT-07-0262-FEDER-001878). The authors are grateful for the award of post-doc grants to C. S. M. from both ALENT07-0224-FEDER-001743 and from the Fundação para a Ciência e a Tecnologia (FCT) (SFRH/BPD/92394/2013). LabRMN (University of Évora) is acknowledged for recording the NMR spectra.

Keywords: Homogeneous catalysis · Rhodium · Nitrogen heterocycles · Ketimines

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Received: November 5, 2015
Published Online: December 23, 2015