Convenient Synthesis of Alkenyl-, Alkynyl-, and Allenyl-Substituted Imidazo[1,2-*a*]pyridines *via* Palladium-Catalyzed Cross-Coupling Reactions

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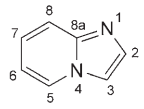
A systematic study on the *Stille* and *Sonogashira* cross-coupling of iodinated imidazo[1,2-*a*]pyridines was performed, permitting the preparation of various vinyl-, ethynyl-, and allenyl-substituted derivatives. These methods are particularly valuable, given their experimental simplicity and high degree of flexibility with regard to functional groups that can be introduced in positions 3, 6, or 8 of the imidazo[1,2-*a*]-pyridine core. Effects concerning different substitution positions and the nature of the 2-substituent under various reaction conditions are reported in detail for the above types of unsaturated groups introduced.

Introduction. – The significant and potential biological activities of compounds sharing the imidazo[1,2-*a*]pyridine moiety have been widely exploited in various pharmacological areas in medicinal chemistry, for example in virology, including treatment of hepatitis C [1], herpes [2] and HIV [3]; in cancerology, as antagonists of the gonadotropin-releasing hormone receptor [4], PI3 kinase p110α inhibitors [5] and histone deacetylase inhibitors [6]; as well as in neurology, as C3a-receptor antagonists [7] and D4 partial agonist [8]. In the course of our studies evaluating the chemical and pharmacological properties of this heterocyclic system, we have extensively investigated metallo-catalyzed methods of functionalization that allow the rapid preparation of a number of structural variants [9]. The aim of these systematic studies is to determine the best cross-coupling reaction conditions, depending on the nature of the imidazo[1,2-*a*]pyridine starting material and the coupling partner. These novel synthetic methodologies are being applied to broaden the available tools in pharmacology [2][8][9c][10].



Imidazo[1,2-*a*]pyridine

While performing further investigations into the functionalization of the imidazo[1,2-*a*]pyridine core, we have focused on the transfer of unsaturated groupings mainly through *Stille* and *Sonogashira* cross-coupling reactions. Vinyl and ethynyl

functions are present in many biologically active compounds [11], and are very useful in synthetic organic chemistry. Considerable effort has, therefore, been expended to develop efficient methods for introducing ethynyl groups [12].

Here, we report our results on the preparation of alkenyl, alkynyl, and allenyl imidazo[1,2-*a*]pyridines, emphasizing the versatility of the *Sonogashira* reaction in these series according to the nature of the halogenated starting material and the alkyne. We also present the first methodology for the preparation of allenyl-substituted imidazo[1,2-*a*]pyridines.

Results and Discussion. – 1. *Synthesis of Alkenyl-Substituted Imidazo[1,2-*a*]pyridines.* One of our initial studies comprised the synthesis of 3-, 6-, and 8-vinylated imidazo[1,2-*a*]pyridines using the iodoimidazo[1,2-*a*]pyridines **1a**–**e** as starting materials (see *Tables 1* and *2* below). The introduction of vinyl groups through organozinc reagents (generated *in situ* from organolithium or organomagnesium compounds) in THF or HMPA solution was tested, but resulted in low yields of the desired products, and did not provide a high degree of flexibility with regard to functional groups (data not shown). To achieve high diversity in the vinyl substituents, we, therefore, decided to introduce them by *Stille* cross-coupling [13]. Few examples of *Stille* reaction have been reported in such series. To our knowledge, an example of vinyl or allyl substitution has been reported in position 6 [14] and in position 3 [15], and the coupling of aryl or heteroaryl groups from **1a** in position 6 was reported by our laboratory [16].

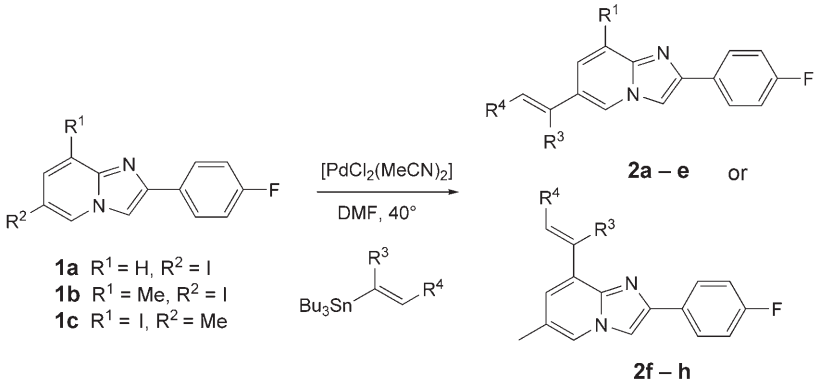
We began with the 6- and 8-iodinated 2-(4-fluorophenyl)imidazo[1,2-*a*]pyridines **1a**–**c** as starting materials to carry out the coupling reaction (*Table 1*). As reported in our previous studies in these series, the phenyl-substituted compounds **1a**–**c** are convenient starting materials, as they are air-stable and easily obtained in good yields. Moreover, NMR interpretation is facilitated by extra fluorine coupling. Thus, *Stille* cross-coupling of **1a**–**c** with different vinyl stannanes in the presence of a catalytic amount (3 mol-%) of dichlorobis(acetonitrile)palladium(II) ($[PdCl_2(MeCN)_2]$) at 40° stereoselectively provided good yields of the 6- or 8-alkenylated compounds **2a**–**h** (*Table 1*). At ambient temperature, the coupling rate was slow, affording poor yields of the products (<20%), leaving a significant amount of starting material.

The results presented in *Table 1* indicated that this synthetic strategy is a general entry to these compounds, compatible with various alkenyl groups, the position of the I-atoms in the starting materials being irrelevant for the course of the coupling reaction. Further, cross-coupling occurred with retention of the configuration of the C=C bond of the vinyl moiety, and no degradation products were observed.

Attention was next focused on the reactivity of the 3-iodinated imidazo[1,2-*a*]pyridines **1d** and **1e**, bearing either a fluorophenyl or an ester group in 2-position (*Table 2*). The aim here was to determine the potential influence of the nature of the 2-substituent on the reactivity at position 3 toward metallo-catalyzed coupling. We found that, under the previously described conditions, temperature was again a crucial parameter, as the coupling of vinyltributyltin did not proceed at 40°, but required heating at 80°, thus demonstrating a difference in reactivity between compounds **1a**–**c** and **1d** or **1e**.

As shown in *Table 2*, better yields were obtained when the substituent at position 2 was an ester group (*Entries 4–6*) compared to an aryl group (*Entries 1–3*). The

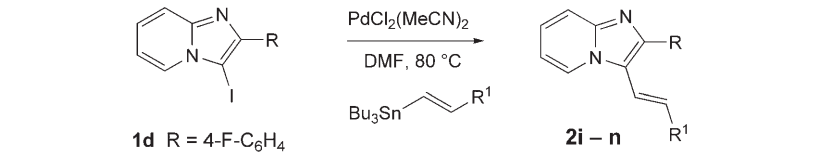
Table 1. Stille *Cross-Coupling of* **1a**–**c** *with Vinyltributyltin Compounds.* Conditions: iodoimidazo[1,2-*a*]pyridine (3 mmol), vinyltributyltin (3.1 mmol), $[PdCl_2(MeCN)_2]$ (3 mol-%), DMF (10 ml), 40°, 4 h.



Entry	R^1	R^2	R^3	R^4	Product	Yield [%][a])
1	H	I	Me	H	**2a**	82
2	H	I	H	Ph	**2b**	81
3	H	I	H	H	**2c**	79
4	Me	I	H	Me_3Si	**2d**	83
5	Me	I	H	Ph	**2e**	84
6	I	Me	H	H	**2f**	81
7	I	Me	H	Me_3Si	**2g**	86
8	I	Me	H	Ph	**2h**	83

[a]) After purification.

Table 2. Stille *Cross-Coupling of* **1d** *or* **1e** *with Vinyltributyltin Compounds.* Conditions: iodoimidazo[1,2-*a*]pyridine (3 mmol), vinyltributyltin (3.1 mmol), $[PdCl_2(MeCN)_2]$ (3 mol-%), DMF (10 ml), 80°, 4 h.



Entry	R	R^1	Product	Yield [%][a])
1	4-F-C_6H_4	H	**2i**	66
2	4-F-C_6H_4	Ph	**2j**	68
3	4-F-C_6H_4	Me_3Si	**2k**	63
4	EtOOC	H	**2l**	72
5	EtOOC	Ph	**2m**	70
6	EtOOC	Me_3Si	**2n**	74

[a]) After purification.

beneficial influence of the ester group on cross-coupling has already been reported in *Suzuki* reactions [17]. In our case, cross-coupling provided ready access to different 3-alkenylimidazo[1,2-*a*]pyridines of defined configuration.

In all of the above cases, the use of vinylstannane reagents, permit the transfer of a vinyl group to generate a variety of structurally diverse products, **2a**–**n**, bearing alkenyl groups in positions 3, 6, or 8. The *Stille* reaction showed great versatility in the construction of $C(sp^2)-C(sp^2)$ bonds, and required only a very simple procedure.

2. *Synthesis of Alkynyl-Substituted Imidazo[1,2-*a*]pyridines.* In the second part of this project, we decided to introduce an alkynyl group in positions 3, 6, or 8 of our target structure. Pd-Catalyzed cross-coupling reactions of aryl halides or aryl triflates with terminal alkynes, commonly referred to as *Sonogashira* reactions, are a powerful, versatile, and popular tool. However, to our knowledge, few *Sonogashira* couplings have been reported at the 3- and 6-positions of imidazo[1,2-*a*]pyridines. Initially, the yields reported in the literature were very low for *Sonogashira*-type cross-coupling in position 3 (< 35%) [18]. However, *El Kazzouli et al.* [19] recently described a *Sonogashira*-coupling procedure starting from 6-bromo- or 3-iodo-2-phenylimidazo[1,2-*a*]pyridines that provided good yields of the alkynylated compounds. However, as we will demonstrate herein, this particular procedure applied for couplings at C(3) is largely influenced by the nature of the 2-substituent.

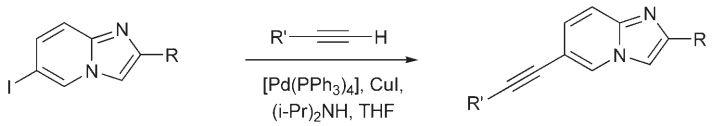
We began our study by applying the *Sonogashira* protocol to the coupling of various terminal alkynes to compounds **1a**, **1f**, and **1g** (*Table 3*). We used catalytic amounts (6 mol-%) of tetrakis(triphenylphosphine)palladium(0) ($[Pd(PPh_3)_4]$) in the presence of CuI (10 mol-%) and 12 equiv. of diisopropylamine in THF. After 1 h of stirring at room temperature (24 h at 50° in the alternative procedure reported in [19]), good yields of coupling products **3** were obtained (74–92%), whatever the nature of the 2-substituent. Only the coupling with ethyl propiolate (= ethyl prop-2-ynoate; *Table 3*, *Entry 7*) was unsuccessful, affording an inseparable mixture of the desired product and starting material. In some cases, heating at 60° for 5 h accelerated the rate of the reaction and improved the yield of the products (*Entries 3* and *11*).

The same reaction conditions as above were then applied to compounds **1c**, **1h**, and **1i**, providing similar results, with good yields of coupling products, whatever the substituent in position 2, again with the exception of ethyl propiolate derivatives (*Table 4*).

As shown in *Scheme 1*, the previously synthesized (trimethylsilyl)ethynyl derivatives **3d**,**h**,**l** and **4d**,**h**,**l**, also obtained *via Sonogashira* coupling, could be efficiently desilylated to the corresponding 6-ethynylimidazo[1,2-*a*]pyridines **5a**–**c** and **6a**–**c**, respectively. Good yields of alkyne deprotection (80–90%) were obtained in THF in the presence of tetrabutylammonium fluoride (TBAF) at room temperature. This methodology, thus, provides a convenient two-step procedure to introduce a terminal ethynyl group into the heterocycle. Indeed, acetylene coupling under *Sonogashira* conditions often gives rise to side products due to double substitution (for representative reviews on the Pd-catalyzed homo-coupling reactions of alkynes, see [20]).

Our *Sonogashira*-type coupling conditions were unsuccessful in position 3 of compound **1d** (*Table 5*, *Entry 1*). We, therefore, decided to test the conditions described by *El Kazzouli et al.* [19], using phenylacetylene in the presence of catalytic amounts

Table 3. Sonogashira *Cross-Coupling of Alkynes with 6-Iodoimidazo[1,2-*a*]pyridines.* Conditions: 6-iodoimidazo[1,2-*a*]pyridine (1 mmol), alkyne (1.5 mmol), [$Pd(PPh_3)_4$] (6 mol-%), CuI (10 mol-%), $(i\text{-}Pr)_2NH$ (12 mmol), THF (2 ml), r.t., 1 h.



1a R = 4-F-C_6H_4
1f R = Me
1g R = EtOOC

3a – l

Entry	R	R′	Product	Yield [%][a])
1	Me	C_6H_5	**3a**	80
2	Me	$HOCH_2$	**3b**	83
3[b])	Me	EtOOC	**3c**	79
4	Me	Me_3Si	**3d**	74
5	4-F-C_6H_4	C_6H_5	**3e**	92
6	4-F-C_6H_4	$HOCH_2$	**3f**	92
7	4-F-C_6H_4	EtOOC	**3g**	[c])
8	4-F-C_6H_4	Me_3Si	**3h**	83
9	EtOOC	C_6H_5	**3i**	87
10	EtOOC	$HOCH_2$	**3j**	92
11[b])	EtOOC	EtOOC	**3k**	37
12	EtOOC	Me_3Si	**3l**	83

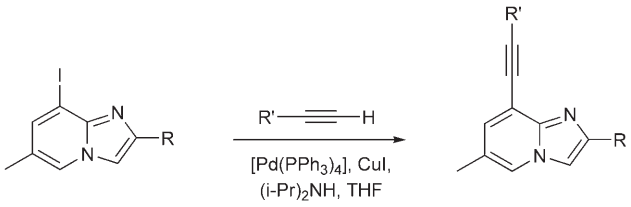
[a]) After purification. [b]) At 60° for 5 h. [c]) Inseparable mixture.

(10 mol-%) of bis(triphenylphosphine)palladium(II) chloride ($[PdCl_2(PPh_3)_2]$) and CuI (10 mol-%) in a mixture of Et_3N and DMF. Starting from 2-(4-fluorophenyl)-3-iodoimidazo[1,2-*a*]pyridine (**1d**), the coupling product **8a** was obtained in 75% yield (*Table 5*, *Entry 2*). Unfortunately, when position 2 was substituted with an ester group, only 16% of the alkynylated compound **8b** was formed after 24 h at room temperature (*Entry 3*). When using tris(dibenzylideneacetone)dipalladium(0) ($[Pd_2(dba)_3]$), a much better yield (64%) of **8b** was obtained (*Entry 4*). From these experiments, we conclude that the reactivity at position 3 of imidazo[1,2-*a*]pyridines toward *Sonogashira* coupling is largely influenced by the nature of the substituent in position 2.

We next decided to determine the influence of pyridine substitution on the coupling efficacy. Interestingly, our methodology (6 mol-% $[Pd(PPh_3)_4]$, 10 mol-% CuI, 12 equiv. of $i\text{-}Pr_2NH$ in THF), completely unsuccessful in the synthesis of **1d**, was modestly efficient in the case of **1j** (*Entry 5*, 30% yield, not optimized), which possesses a Me group and a Br-atom in positions 6 and 8, respectively. Thus, the reactivity at position 3 toward *Sonogashira* coupling seems also to be largely influenced by the nature of the substituents on the six-membered ring.

Introduction of an ethynyl or propynyl group is often difficult *via Sonogashira* coupling due to the gaseous nature of these alkynes and the formation of double-substitution products in the case of ethyne. We previously proposed the use of silylated acetylene for the introduction of the acetylene group, which then requires a

Table 4. Sonogashira *Cross-Couplings of Alkynes with 8-Iodoimidazo[1,2-*a*]pyridines.* Conditions: as in *Table 3.*



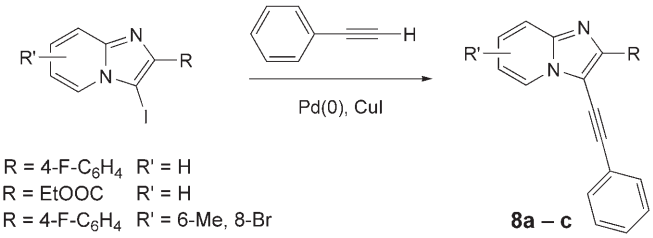
1c R = 4-F-C_6H_4
1h R = Me
1i R = EtOOC

4a – l

Entry	R	R′	Product	Yield [%][a])
1	Me	C_6H_5	**4a**	83
2	Me	$HOCH_2$	**4b**	81
3	Me	EtOOC	**4c**	n.i.[b])
4	Me	Me_3Si	**4d**	54
5	4-F-C_6H_4	C_6H_5	**4e**	94
6	4-F-C_6H_4	$HOCH_2$	**4f**	87
7	4-F-C_6H_4	EtOOC	**4g**	49
8	4-F-C_6H_4	Me_3Si	**4h**	81
9	EtOOC	C_6H_5	**4i**	85
10	EtOOC	$HOCH_2$	**4j**	74
11	EtOOC	EtOOC	**4k**	n.i.
12	EtOOC	Me_3Si	**4l**	79

[a]) After purification. [b]) Not isolated.

Table 5. Sonogashira *Cross-Couplings of Phenylacetylene with 3-Iodoimidazo[1,2-*a*]pyridines*



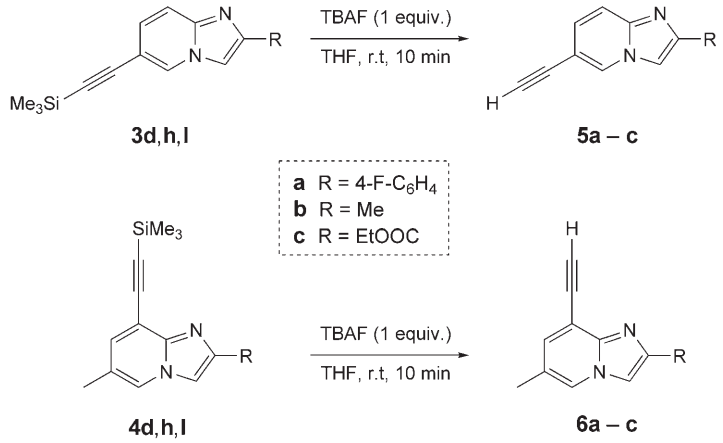
1d R = 4-F-C_6H_4 R' = H
1e R = EtOOC R' = H
1j R = 4-F-C_6H_4 R' = 6-Me, 8-Br

8a – c

Entry	R	R′	Catalyst	Base	Product	Yield [%][a])
1	4-F-C_6H_4	H	$[Pd(PPh_3)_4]$	$(i\text{-}Pr_2)NH$	**8a**	0[b])
2	4-F-C_6H_4	H	$[PdCl_2(PPh_3)_2]$	Et_3N	**8a**	75[c])
3	EtOOC	H	$[PdCl_2(PPh_3)_2]$	Et_3N	**8b**	16[c])
4	EtOOC	H	$[Pd_2(dba)_3]$	Et_3N	**8b**	64[c])
5	4-F-C_6H_4	6-Me, 8-Br	$[Pd(PPh_3)_4]$	$(i\text{-}Pr_2)NH$	**8c**	30[b])

[a]) After purification. [b]) Conditions: **1** (1 mmol), phenylacetylene (1.5 mmol), Pd(0) (6 mol-%), CuI (10 mol-%), base (12 mmol), THF (2 ml), r.t., 1 h. [c]) Conditions: **1** (1.5 mmol), phenylacetylene (1.8 mmol), Pd(0) (10 mol-%), CuI (10 mol-%), base (1.5 ml), DMF (1.5 ml), r.t., 24 h.

Scheme 1

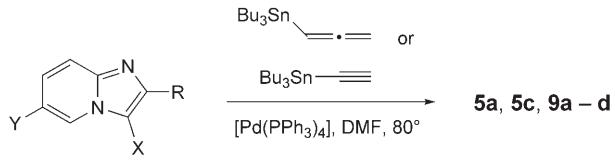


deprotection step. *Stille* coupling may be an alternative for the introduction of ethynyl or propynyl groups. We therefore chose ethynyl- and allenyl(tributyl)stannanes as reagents [21a]. Thereby allenyltin compounds were prepared from 3-bromoprop-1-yne, Mg, and Bu_3SnCl under Pb(II) catalysis [21b]. The reactions proceeded smoothly in DMF in the presence of $[Pd(PPh_3)_4]$ (6 mol-%) at 80°, affording good yields of compounds **5a** and **5c** as well as **9a**–**d** (*Table 6*). The coupling of **1a** or **1e** with allenyl(tributyl)tin afforded the new 6- or 3-(prop-1-ynyl)imidazo[1,2-*a*]pyridines **9c** and **9d**, respectively, as the only products, without any trace of the corresponding allenyl-coupled analogues.

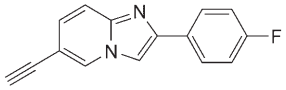
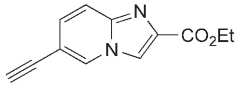
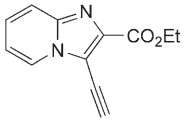
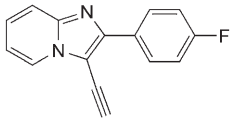
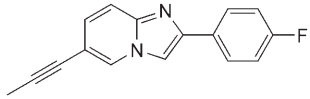
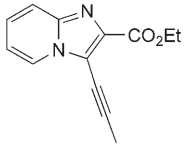
In conclusion, we now have various methods at our disposal for the synthesis of alkynyl-substituted imidazo[1,2-*a*]pyridine compounds, depending on the nature of the alkyne and the substitution position in the heterocycle. As previously noted with *Stille* couplings, C(3) appears to be less reactive to *Sonogashira* reactions than C(6) or C(8), especially when there is an ester at position 2. This could be rationalized by coordination of the Cu salts and the polar ester group. Nevertheless, adapting the *Sonogashira* conditions, particularly in terms of the catalyst and solvent, allows alkyne introduction in the three positions studied; and ethynyl and propynyl groups can be efficiently transferred to positions 3 and 6 under *Stille* conditions.

3. *Synthesis of Allenyl-Substituted Imidazo[1,2-*a*]pyridines.* At this point in our study, we observed that the coupling reactions of allenyl(tributyl)stannane to 3- or 6-iodoimidazo[1,2-*a*]pyridines under *Stille* conditions led to the complete rearrangement of the allenyl to a propynyl group. We then applied the *Nakamura* method, consisting of allene transformation of propargylic amines [22]. The heterocyclic allene precursor was synthesized using the previously described *Sonogashira* coupling of *N*,*N*-diisopropyl-(prop-2-ynyl)amine (= *N*,*N*-bis(1-methylethyl)prop-2-yn-1-amine) with 3-, 6-, or 8-iodoimidazo[1,2-*a*]pyridines (*Scheme 2*). The propargylic diisopropylamines were obtained from the corresponding bromides. Allene transformation took 24 h in the presence of $[Pd_2(dba)_3(CHCl_3/ligand)]$ as catalyst at 100° in $CHCl_3$.

Table 6. *Palladium-Catalyzed Synthesis of Alkynyl-Substituted Imidazo[1,2-*a*]pyridines.* Conditions: iodoimidazo[1,2-*a*]pyridine (1 mmol), allene or alkyne (1.8 mmol), Pd(0) (6 mol-%), DMF (5 ml), 4 h, 80°.



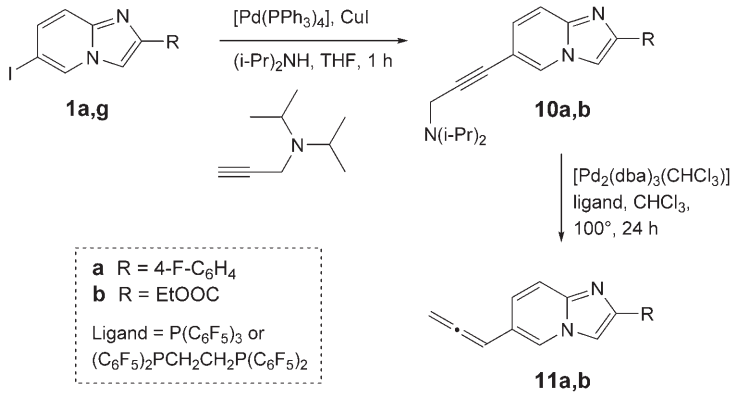
1a R = 4-F-C_6H_4, X = H, Y = I
1d R = 4-F-C_6H_4, X = I, Y = H
1e R = EtOOC, X = I, Y = H

R	X	Y	Product	Product	Yield [%][a])
4-F-C_6H_4	H	I		**5a**	78
EtOOC	H	I		**5c**	75
EtOOC	I	H		**9a**	70
4-F-C_6H_4	I	H		**9b**	64
4-F-C_6H_4	H	I		**9c**	66
EtOOC	I	H		**9d**	55

[a]) After purification.

The *Sonogashira* coupling of *N*,*N*-diisopropyl(prop-2-ynyl)amine to the 6-iodo-imidazo[1,2-*a*]pyridines **1a** and **1g** proceeded efficiently, when using our previously described procedure, giving rise to 81 and 75% yield, respectively (*Scheme 2*). Two ligands were then evaluated for the allene transformation of **10**. Moderate yields (*ca.* 40%) were obtained with tris(pentafluorophenyl)phosphine ($P(C_6F_5)_3$) as ligand,

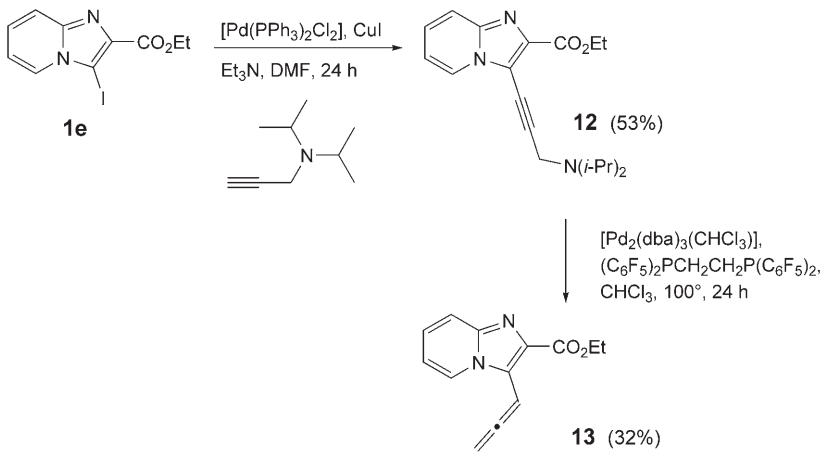
Scheme 2



while the efficiency of the reaction was considerably improved (70% yield) when using '1,2-bis[bis(pentafluorophenyl)phosphino]ethane'[1]).

There were difficulties with the *Sonogashira* coupling of *N*,*N*-diisopropyl(prop-2-ynyl)amine in 3-position. In this case, the coupling efficiently yielded **12** (53% yield) in the presence of an ester group in position 2, but failed in the presence of a 4-fluorophenyl group, leading to inseparable mixtures. The allene transformation of **12**, performed in the presence of $(C_6F_5)_2PCH_2CH_2P(C_6F_5)_2$ as ligand provided 32% of the expected compound **13** (*Scheme 3*).

Scheme 3



The *Nakamura* methodology, thus, gave us the opportunity to introduce an allenyl group in positions 3 and 6 of the imidazo[1,2-*a*]pyridine nucleus. Further studies are in

[1]) Systematic name: 1,2-ethanediylbis[bis(pentafluorophenyl)phosphine].

progress to improve this original method and to expand it to the 8-position of this important heterocycle.

Conclusions. – We have demonstrated that the *Stille* reaction is a suitable method to introduce alkenyl substituents into positions 3, 6, and 8 of imidazo[1,2-*a*]pyridines. The use of allenyl- or ethynyl(tributyl)stannanes permits the transfer of a propynyl or ethynyl group, respectively. It should be noted that better yields of 6- and 8-alkenylated (or alkynylated) imidazo[1,2-*a*]pyridines were obtained than for the corresponding 3-substituted congeners, thus showing better reactivity of **1a**–**c** compared to **1d** or **1e**. *Sonogashira* coupling generally provided a more versatile approach for the introduction of alkynyl substituents into the 3-, 6-, and 8-positions of imidazo[1,2-*a*]pyridines, the reaction conditions requiring modification according to the nature of the alkyne used and the substitution position. Finally, we achieved the synthesis of 3- or 6-allenyl-substituted imidazo[1,2-*a*]pyridines by means of *Sonogashira* coupling and the Pd-catalyzed allene transformation. Further studies are in progress to ascertain the scope and limitations of this procedure, as well as its applicability to the preparation of new imidazo[1,2-*a*]pyridine derivatives.

Experimental Part

General. The following compounds were prepared according to published procedures: *2-(4-fluorophenyl)-6-iodoimidazo[1,2-*a*]pyridine* (**1a**) [9a], *2-(4-fluorophenyl)-8-iodo-6-methylimidazo[1,2-*a*]pyridine* (**1c**) [23], *2-(4-fluorophenyl)-3-iodoimidazo[1,2-*a*]pyridine* (**1d**) [17], *ethyl 3-iodoimidazo[1,2-*a*]pyridine-2-carboxylate* (**1e**) [17], *ethyl 6-iodoimidazo[1,2-*a*]pyridine-2-carboxylate* (**1g**) [24], *8-iodo-2,6-dimethylimidazo[1,2-*a*]pyridine* (**1h**) [23], *ethyl 8-iodo-6-methylimidazo[1,2-*a*]pyridine-2-carboxylate* (**1i**) [23]. The reagent (*E*)-1-(tributylstannyl)-2-(trimethylsilyl)ethene was prepared by hydrostannation of (trimethylsilyl)acetylene [25]. (*E*)-Tributyl(*β*-styryl)stannane was prepared by hydrostannation of phenylacetylene [26]. (Tributylstannyl)acetylene was prepared from ethynyllithium–ethylene-1,2-diamine complex and Bu_3SnCl [21a]. All reactions were carried out under inert atmosphere (Ar or N_2). THF and Et_2O were dried and freshly distilled from Na/benzophenone. DMF was distilled from CaH_2. Flash chromatography (FC) was carried out on *Merck* silica gel (230–400 mesh) or Al_2O_3. Melting points (m.p.) are uncorrected. IR Spectra: *Perkin-Elmer 781* FT-IR spectrophotometer; in cm^{-1}. ^{1}H-NMR Spectra: *Bruker DPX-200*; at 200 MHz in $CDCl_3$ (unless noted otherwise); δ in ppm rel. to residual solvent signals (δ(H) = 7.25 ppm), *J* in Hz. ^{13}C-NMR Spectra: at 50.32 MHz in $CDCl_3$ (unless noted otherwise); solvent peak at δ(C) 77.0 ppm. Mass spectra: recorded on a *Hewlett-Packard 5989A* GC/EI-MS apparatus, at 70 eV; in *m*/*z*.

*2-(4-Fluorophenyl)-6-iodo-8-methylimidazo[1,2-*a*]pyridine* (**1b**). A mixture of 2-amino-5-iodo-3-methylpyridine (1.5 g, 6.4 mmol) and α-bromo-4-fluoroacetophenone (1.53 g, 7.0 mmol) in EtOH (20 ml) was refluxed for 5 h. After cooling, the precipitate was filtered off and suspended in H_2O. The suspension was rendered alkaline with Na_2CO_3, and the solid was filtered off. After dissolution of the solid in CH_2Cl_2, the org. phase was washed with H_2O, dried ($CaCl_2$), and concentrated to afford 1.46 g (64%) of **1b**. M.p. 187°. ^{1}H-NMR: 8.26 (*s*, H–C(5)); 7.95 (*dd*, *J* = 8.6, 5.4, H–C(2,6) of C_6H_4F); 7.73 (*s*, H–C(3)); 7.20 (*s*, H–C(7)); 7.15 (*t*, *J* = 8.6, H–C(3,5) of C_6H_4F); 2.65 (*s*, Me). ^{13}C-NMR: 163.2 (*J* = 245.5); 145.2; 145.1; 131.6; 130.1; 129.3; 128.7; 128.3 (*J* = 8); 116.1 (*J* = 21.5); 108.2; 75.7; 17.2.

*Ethyl 3-Iodoimidazo[1,2-*a*]pyridine-2-carboxylate* (**1e**). *N*-Iodosuccinimide (5.3 g, 23.6 mmol) was added to a soln. of ethyl imidazo[1,2-*a*]pyridine-2-carboxylate (3 g, 15.8 mmol) in anh. MeCN (50 ml). The mixture was stirred at r.t. for 1 h. The filtrate was concentrated, and the residue was purified by FC (Al_2O_3; CH_2Cl_2) to afford 3.3 g (66%) of **1e**. M.p. 144°. ^{1}H-NMR: 8.31 (*dt*, *J* = 7, 1.1, H–C(5)); 7.72 (*dt*, *J* = 9.2, 1.1, H–C(8)); 7.38 (*ddd*, *J* = 9.2, 7, 1.1, H–C(7)); 7.05 (*td*, *J* = 7, 1.1, H–C(6)); 4.54 (*q*, *J* = 7.1, CH_2); 1.51 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.1; 148.2; 138.5; 127.5 (2C); 119.6; 115.1; 68.5; 61.9; 14.8.

*6-Iodo-2-methylimidazo[1,2-*a*]pyridine* (**1f**). A mixture of 2-amino-5-iodopyridine (4 g, 18.2 mmol) and chloroacetone (2.5 g, 27.2 mmol) in EtOH (25 ml) was refluxed for 24 h. After cooling, the solvent was evaporated, and the residue was suspended in H_2O. The suspension was rendered alkaline with Na_2CO_3, and extracted with CH_2Cl_2. After drying ($CaCl_2$), the org. layers were concentrated, and the residue was purified by FC (SiO_2; AcOEt) to afford 4.0 g (85%) of **1f**. M.p. 152–153°. ^{1}H-NMR: 8.30 (*m*, H–C(5)); 7.29–7.34 (*m*, H–C(7), H–C(8), H–C(3)); 2.45 (*s*, Me). ^{13}C-NMR: 144.6; 144.0; 132.1; 130.4; 118.2; 107.9; 74.7; 14.7.

*8-Bromo-2-(4-fluorophenyl)-3-iodo-6-methylimidazo[1,2-*a*]pyridine* (**1j**). To a soln. of 8-bromo-2-(4-fluorophenyl)-6-methylimidazo[1,2-*a*]pyridine (2 g, 6.6 mmol) [23] in anh. MeCN (20 ml) was added *N*-iodosuccinimide (1.63 g, 7.2 mmol). The mixture was stirred at r.t. overnight. The mixture was filtered off to afford 2.7 g (95%) of **1j**. M.p. 225°. ^{1}H-NMR: 7.98 (*dd*, J = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.96 (*d*, J = 1.4, H–C(5)); 7.39 (*d*, J = 1.4, H–C(7)); 7.13 (*t*, J = 8.8, H–C(3,5) of C_6H_4F); 2.38 (*s*, Me).

General Procedure for the Preparation of **2a**–**n**. A dry three-necked flask equipped with a magnetic stirring bar and a septum was charged with **1** (3 mmol) in DMF (10 ml) and vinyl(tributyl)tin (3.1 mmol). Then, [$PdCl_2(MeCN)_2$] (63 mg, 0.09 mmol, 3 mol-%) was added, and the resulting soln. was stirred under Ar gas for 4 h at 40 or 80°. The mixture was diluted with Et_2O (30 ml), washed with a sat. NH_4Cl soln. (2 × 20 ml), and dried ($MgSO_4$). After evaporation of the solvents, the crude product **2** was purified either by FC (SiO_2; petroleum ether (PE)/Et_2O/Et_3N 25 : 73 : 2) or by crystallization from Et_2O.

*2-(4-Fluorophenyl)-6-(1-methylethenyl)imidazo[1,2-*a*]pyridine* (**2a**). Colorless solid. M.p. 114°. ^{1}H-NMR: 8.16 (br. *s*, H–C(5)); 7.94 (*dd*, J = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.82 (*s*, H–C(3)); 7.62 (*d*, J = 10, H–C(8)); 7.46 (*dd*, J = 10, 2, H–C(7)); 7.15 (*t*, J = 8.7, H–C(3,5) of C_6H_4F); 5.48 (*s*, HC=); 5.21 (*s*, H_2C=)); 2.20 (*s*, Me). ^{13}C-NMR: 163.3 (J = 244); 145.0; 144.6; 138.9; 129.4; 127.7 (J = 8); 127.0; 124.3; 122.1; 116.4; 115.7 (J = 21); 113.7; 108.3; 53.5. EI-MS: 252 (100, M^+), 251 (17), 237 (11), 212 (11). HR-EI-MS: 252.1067 (M^+, $C_{16}H_{13}FN_2^+$; calc. 252.1063).

*2-(4-Fluorophenyl)-6-(1-phenylethenyl)imidazo[1,2-*a*]pyridine* (**2b**). Colorless solid. M.p. 208°. ^{1}H-NMR: 8.12 (br. *s*, H–C(5)); 7.92 (*dd*, J = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.77 (*s*, H–C(3)); 7.63 (*d*, J = 10, H–C(8)); 7.54–7.50 (*m*, H–C(2,6) of C_6H_5, H–(C7)); 7.43–7.26 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.13 (*t*, J = 8.7, H–C(3,5) of C_6H_4F); 7.10, 6.98 (2*d*, J = 16.5 each, H_2C=). ^{13}C-NMR: 163.6 (J = 250); 145.6; 145.5; 137.1; 130.3 (J = 3); 129.8; 129.2; 128.5; 128.0 (J = 8); 127.0; 124.4; 124.3; 124.0; 123.2; 117.7; 116.0 (J = 21.6); 108.6. EI-MS: 314 (100, M^+), 178 (6), 165 (8). HR-EI-MS: 314.1225 (M^+, $C_{21}H_{15}FN_2^+$; calc. 314.1219).

*6-Ethenyl-2-(4-fluorophenyl)imidazo[1,2-*a*]pyridine* (**2c**). Colorless solid. M.p. 186°. ^{1}H-NMR: 8.02 (br. *s*, H–C(5)); 7.93 (*dd*, J = 8.6, 5, H–C(2,6) of C_6H_4F); 7.76 (*s*, H–C(3)); 7.59 (*d*, J = 9.5, H–C(8)); 7.41 (*dd*, J = 9.5, 1.6, H–C(7)); 7.14 (*t*, J = 8.6, H–C(3,5) of C_6H_4F); 6.65 (*dd*, J = 16.2, 11, HC=); 5.76 (*d*, J = 16.2, H_2C=); 5.35 (*d*, J = 11, H_2C=). ^{13}C-NMR: 163.1 (J = 245); 145.6; 145.5; 132.8; 130.2 (J = 3); 128.0 (J = 8); 124.1; 124.0; 123.0; 117.5, 116.0 (J = 21.5); 114.8; 108.5. EI-MS: 238 (100, M^+), 237 (14), 104 (10). HR-EI-MS: 238.0911 (M^+, $C_{15}H_{11}FN_2^+$; calc. 238.0906).

*2-(4-Fluorophenyl)-8-methyl-6-[(*E*)-2-(trimethylsilyl)ethenyl]imidazo[1,2-*a*]pyridine* (**2d**). Colorless solid. M.p. 118°. ^{1}H-NMR: 7.96 (*dd*, J = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.95 (br. *s*, H–C(5)); 7.76 (*s*, H–C(3)); 7.28 (br. *s*, H–C(7)); 7.15 (*t*, J = 8.7, H–C(3,5) of C_6H_4F); 6.79 (*d*, J = 19, HC=)); 6.47 (*d*, J = 19, HC=); 2.69 (*s*, Me); 0.22 (*s*, 3 Me). ^{13}C-NMR: 163.0 (J = 245); 146.2; 144.8; 139.4; 130.7; 130.2; 128.2 (J = 8); 127.4; 125.0; 123.0; 122.0; 115.5 (J = 21.6); 109.0; 17.7; –0.86. EI-MS: 324 (97, M^+), 323 (20), 310 (24), 309 (100). HR-EI-MS: 324.1462 (M^+, $C_{19}H_{21}FN_2Si^+$; calc. 324.1458).

*2-(4-Fluorophenyl)-8-methyl-6-[(*E*)-2-phenylethenyl]imidazo[1,2-*a*]pyridine* (**2e**). Colorless solid. M.p. 200°. ^{1}H-NMR: 8.01 (br. *s*, H–C(5)); 7.97 (*dd*, J = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.75 (*s*, H–C(3)); 7.55 (*d*, J = 8, H–C(2,6) of C_6H_5); 7.46–7.32 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.33 (*d*, J = 2, H–C(7)); 7.16 (*t*, J = 8.7, H–C(3,5) of C_6H_4F); 7.12 (*d*, J = 16, HC=); 7.00 (*d*, J = 16, HC=); 2.72 (*s*, Me). ^{13}C-NMR: 163.1 (J = 245); 145.7; 144.6; 137.0; 130.1; 129.1; 129.0; 128.0; 127.7; 127.2; 126.5; 124.4; 123.5; 122.0; 121.4; 115.5 (J = 21.6); 108.6; 17.3. EI-MS: 328 (100, M^+), 327 (37), 313 (10), 165 (7). HR-EI-MS: 328.1381 (M^+, $C_{22}H_{17}FN_2^+$; calc. 328.1376).

*8-Ethenyl-2-(4-fluorophenyl)-6-methylimidazo[1,2-*a*]pyridine* (**2f**). Colorless solid. M.p. 92°. ^{1}H-NMR: 7.96 (*dd*, J = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.82 (br. *s*, H–C(5)); 7.72 (*s*, H–C(3)); 7.17 (*t*,

J = 8.8, H–C(3,5) of C_6H_4F); 7.12 (*dd*, J = 17.5, 11, HC=); 7.04 (br. *s*, H–C(7)); 6.75 (*dd*, J = 17.5, 1.7, H_2C=); 5.64 (*dd*, J = 11, 1.7, H_2C=); 2.32 (*s*, Me). ^{13}C-NMR: 163 (J = 246); 144.7; 143.6; 132.4; 130.6; 128.0 (J = 8); 126.3; 126.0; 122.7; 122.2; 120.0; 116.5 (J = 21.6); 108.0; 18.5. EI-MS: 252 (100, M^+), 251 (97), 226 (10). HR-EI-MS: 252.1071 (M^+, $C_{16}H_{13}FN_2^+$; calc. 252.1063).

*2-(4-Fluorophenyl)-6-methyl-8-[(*E*)-2-(trimethylsilyl)ethenyl]imidazo[1,2-*a*]pyridine* (**2g**). Colorless solid. M.p. 152°. ^{1}H-NMR: 7.92 (*dd*, J = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.77 (br. *s*, H–C(5)); 7.67 (*s*, H–C(3)); 7.34 (*s*, H–C(7)); 7.28 (*d*, J = 20, HC=); 7.08 (*t*, J = 8.8, H–C(3,5) of C_6H_4F); 7.06 (*d*, J = 20, HC=); 2.28 (*s*, Me); 0.19 (*s*, 3 Me). ^{13}C-NMR: 163 (J = 246); 144.7; 143.8; 138.6; 135.8; 130.8; 128.1 (J = 7.5); 126.8; 125.3; 122.8; 122.3; 116 (J = 22); 108.0; 18.5; –0.7. EI-MS: 324 (29, M^+), 309 (35), 279 (12), 252 (18), 251 (100). HR-EI-MS: 324.1462 (M^+, $C_{19}H_{21}FN_2Si^+$; calc. 324.1458).

*2-(4-Fluorophenyl)-6-methyl-8-[(*E*)-2-phenylethenyl]imidazo[1,2-*a*]pyridine* (**2h**). Colorless solid. M.p 137.5°. ^{1}H-NMR: 8.17 (*d*, J = 18, HC=)); 7.97 (*dd*, J = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.76 (br. *s*, H–C(5)); 7.69 (*s*, H–C(3)); 7.63 (*d*, J = 8, H–C(2,6) of C_6H_5); 7.47 (*d*, J = 18, HC=); 7.41–7.20 (*m*, H–C(3,5) and H-C(4) of C_6H_5); 7.10 (*t*, J = 8.8, H–C(3,5) of C_6H_4F); 7.08 (br. *s*, H–C(7)); 2.25 (*s*, Me). ^{13}C-NMR: 162.2 (J = 246); 143.8; 142.7; 137.2; 133.3; 129.9; 128.2 (2 arom. C); 127.4 (J = 8.1); 127.3; 126.6 (2 arom. C); 126.0; 125.6; 125.1; 123.4; 121.6; 115.0 (J = 21.6); 107.3; 17.7. EI-MS: 328 (59, M^+), 327 (100), 251 (6). HR-EI-MS: 328.1380 (M^+, $C_{22}H_{17}FN_2^+$; calc. 328.1376).

*3-Ethenyl-2-(4-fluorophenyl)imidazo[1,2-*a*]pyridine* (**2i**). Colorless solid. M.p. 99°. ^{1}H-NMR: 8.40 (*d*, J = 7, H–C(5)); 7.82 (*dd*, J = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.67 (*d*, J = 9, H–C(8)); 7.30–7.12 (*m*, H–C(3,5) of C_6H_4F, H–C(7)); 6.95 (*dd*, J = 18, 12, HC=)); 6.89 (*t*, J = 7, H–C(6)); 5.73 (*dd*, J = 18, 0.7, H_2C=)); 5.58 (*dd*, J = 12, 0.7, H_2C=). ^{13}C-NMR: 162.0 (J = 247); 145.4; 143.8; 131.0; 130.7; 130.5; 125.0; 124.2; 118.7; 117.7; 116.1; 115.5 (J = 21.6); 112.8. EI-MS: 238 (60, M^+), 237 (100), 236 (25), 118 (12). HR-EI-MS: 238.0911 (M^+, $C_{15}H_{11}FN_2^+$; calc. 238.0906).

*2-(4-Fluorophenyl)-3-[(*E*)-2-phenylethenyl]imidazo[1,2-*a*]pyridine* (**2j**). Colorless solid. M.p. 114°. ^{1}H-NMR: 8.42 (*dd*, J = 7, 1, H–C(5)); 7.88 (*dd*, J = 8.8, 5.3, H–C(2,6) of C_6H_4F); 7.70 (*dd*, J = 9, 1, H–C(8)); 7.53–7.15 (*m*, H–C(7), 5 H of C_6H_5, H–C(3,5) of C_6H_4F); 7.14 (*d*, J = 17, HC=); 7.10 (*d*, J = 17, HC=); 6.89 (*td*, J = 7, 1, H–C(6)). ^{13}C-NMR: 163.0 (J = 246); 146.0; 144.7; 137.0; 133.2; 129.3; 129.0; 128.4; 128 (J = 7); 126.8; 126.6; 125.3; 124.7; 119.2; 118.2; 116.0 (J = 20); 113.0. EI-MS: 314 (100, M^+), 313 (69), 237 (16), 78 (12). HR-EI-MS: 314.1225 (M^+, $C_{21}H_{15}FN_2^+$; calc. 314.1219).

*2-(4-Fluorophenyl)-3-[(*E*)-2-(trimethylsilyl)ethenyl]imidazo[1,2-*a*]pyridine* (**2k**). Colorless solid. M.p. 107–109°. ^{1}H-NMR: 8.46 (*dd*, J = 7, 1.1, H–C(5)); 7.79 (*dd*, J = 8.8, 5.5, H–C(2,6) of C_6H_4F); 7.65 (*dd*, J = 9, 1.2, H–C(8)); 7.23 (*ddd*, J = 9, 7, 1.1, H–C(7)); 7.15 (*t*, J = 8.8, H–C(3,5) of C_6H_4F); 7.10 (*d*, J = 20, HC=); 6.88 (*td*, J = 7, 1.2, H–C(6)); 6.40 (*d*, J = 20, HC=); 0.20 (*s*, 3 Me). ^{13}C-NMR: 163.2 (J = 245); 147.6; 144.8; 134.2; 131.2; 128.7 (J = 5); 127.1; 126.0; 125.7; 118.3; 117.0 (J = 21.3); 114.2; 107.2; 0.1 (3C). EI-MS: 310 (88, M^+), 309 (100), 295 (73), 237 (43), 217 (57). HR-EI-MS: 310.1306 (M^+, $C_{18}H_{19}FN_2Si^+$; calc. 310.1302).

*Ethyl 3-Ethenylimidazo[1,2-*a*]pyridine-2-carboxylate* (**2l**). Colorless solid. M.p. 47–49°. ^{1}H-NMR: 8.41 (*dt*, J = 8, 1.1, H–C(5)); 7.70 (*dd*, J = 10, 1.1, H–C(8)); 7.41 (*dd*, J = 18, 12, HC=); 7.26 (*ddd*, J = 10, 8, 1.1, H–C(7)); 6.91 (*td*, J = 8, 1.1, H–C(6)); 5.91 (*d*, J = 18, H_2C=); 5.73 (*d*, J = 12, H_2C=); 4.47 (*q*, J = 6, CH_2); 1.46 (*t*, J = 6, Me). ^{13}C-NMR: 168.0; 145.0; 134.0; 129.0; 126.4; 125.2; 124.1; 119.6; 118.0; 114.0; 61.4; 14.8. EI-MS: 216 (75, M^+), 171 (26), 144 (81), 143 (100). HR-EI-MS: 216.0902 (M^+, $C_{12}H_{12}N_2O_2^+$; calc. 216.0899).

*Ethyl 3-[(*E*)-2-Phenylethenyl]imidazo[1,2-*a*]pyridine-2-carboxylate* (**2m**). Colorless solid. M.p. 198°. ^{1}H-NMR: 8.50 (*d*, J = 7, H–C(5)); 7.84 (*d*, J = 16, HC=); 7.74 (*d*, J = 9.2, H–C(8)); 7.61 (*d*, J = 7, H–C(2,6) of C_6H_4F); 7.49–7.21 (*m*, H–C(3,5) and H–C(4) of C_6H_4F, H–C(7)); 7.34 (*d*, J = 16, HC=); 6.97 (*t*, J = 7, H–C(6)); 4.91 (*q*, J = 7.2, CH_2); 1.49 (*t*, J = 7.2, Me). ^{13}C-NMR: 163.6; 144.7; 136.4; 131.3; 135.0; 129.7; 128.6; 128.2; 126.7; 126.4; 124.8; 119.2; 113.6; 112.7; 61.0; 14.2. EI-MS: 292 (65, M^+), 219 (100), 206 (24), 118 (61), 78 (46). HR-EI-MS: 292.1217 (M^+, $C_{18}H_{16}N_2O_2^+$; calc. 292.1212).

*Ethyl 3-[(*E*)-2-(Trimethylsilyl)ethenyl]imidazo[1,2-*a*]pyridine-2-carboxylate* (**2n**). Colorless solid. M.p. 58–60°. ^{1}H-NMR: 8.45 (*dd*, J = 7, 1, H–C(5)); 7.64 (*dd*, J = 9, 1, H–C(8)); 7.60 (*d*, J = 20, HC=); 7.21 (*ddd*, J = 9, 7, 1, H–C(7)); 6.87 (*td*, J = 7, 1, H–C(6)); 6.53 (*d*, J = 20, HC=); 4.43 (*q*, J = 7, CH_2); 1.4 (*t*, J = 7, Me); 0.29 (*s*, 3 Me). ^{13}C-NMR: 162.8; 144.8; 137.7; 134.1; 128.2; 127.6; 125.2; 119.4; 114.0; 111.7;

61.2; 14.2; 0.2 (3 C). EI-MS: 288 (19, M^+), 273 (39), 245 (100), 187 (15), 73 (13). HR-EI-MS: 288.1298 (M^+, $C_{15}H_{20}N_2O_2Si^+$; calc. 288.1294).

General Procedure for Sonogashira *Cross-Coupling. Method A*. Into a three-necked round-bottom flask were introduced **1** (1 mmol), [$Pd(PPh_3)_4$] (69 mg, 6 mol-%), CuI (19 mg, 10 mol-%), N_2-sat. (i-$Pr)_2NH$ (1.7 ml, 12 mmol), THF (2 ml) and the appropriate alkyne (1.5 mmol), and the mixture was stirred at r.t. for 1 h.

Method B. Into a three-necked round-bottom flask were introduced **1** (1.5 mmol), [$PdCl_2(PPh_3)_2$] (100 mg, 10 mol-%), CuI (28 mg, 10 mol-%), and the appropriate alkyne (1.8 mmol) in Et_3N/DMF 1:1 (3 ml). The mixture was stirred at r.t. for 24 h.

Method C. Into a three-necked round-bottom flask were introduced **1** (1.5 mmol), [$Pd_2(dba)_3$] (140 mg, 10 mol-%), CuI (28 mg, 10 mol-%), and the appropriate alkyne (1.8 mmol) in Et_3N/DMF 1:1 (3 ml). The mixture was stirred at r.t. for 24 h.

*2-Methyl-6-(phenylethynyl)imidazo[1,2-*a*]pyridine* (**3a**). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 80%. M.p. 102–103°. ^{1}H-NMR: 8.31 (*m*, H–C(5)); 7.57 (*m*, H–C(2,6) of C_6H_5); 7.52 (*d*, *J* = 9.4, H–C(8)); 7.40 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.38 (*s*, H–C(3)); 7.26 (*dd*, *J* = 9.4, 1.6, H–C(7)); 2.50 (*s*, Me). ^{13}C-NMR: 144.9; 144.4; 131.9; 129.0; 128.9; 128.8; 127.3; 123.1; 116.9; 110.2; 109.0; 90.7; 86.0; 14.9. Anal. calc. for $C_{16}H_{12}N_2$: C 82.73, H 5.21, N 12.06; found: C 83.07, H 5.19, N 12.14.

*6-(3-Hydroxyprop-1-ynyl)-2-methylimidazo[1,2-*a*]pyridine* (= *3-(2-Methylimidazo[1,2-*a*]pyridin-6-yl)prop-2-yn-1-ol*; **3b**)[2]. Prepared according to *Method A*; purified by FC (Al_2O_3; AcOEt). Yield: 83%. M.p. 150–151°. ^{1}H-NMR: 8.18 (*m*, H–C(5)); 7.48 (*d*, *J* = 9.3, H–C(8)); 7.34 (*s*, H–C(3)); 7.11 (*dd*, *J* = 9.3, 1.3, H–C(7)); 4.53 (*s*, CH_2); 2.49 (*s*, Me). ^{13}C-NMR: 144.8; 144.3; 128.7; 127.4; 116.9; 110.2; 108.5; 89.1; 82.1; 51.7; 14.7. Anal. calc. for $C_{11}H_{10}N_2O$: C 70.95, H 5.41, N 15.04; found: C 71.13, H 5.29, N 15.14.

*Ethyl 3-(2-Methylimidazo[1,2-*a*]pyridin-6-yl)prop-2-ynoate* (**3c**). *Method A*, but for 5 h at 60°; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 79%. M.p. 106–107°. ^{1}H-NMR: 8.42 (*m*, H–C(5)); 7.53 (*d*, *J* = 9.3, H–C(8)); 7.40 (*s*, H–C(3)); 7.24 (*dd*, *J* = 9.3, 1.6, H–C(7)); 4.34 (*q*, *J* = 7.1, CH_2); 2.50 (*s*, Me); 1.39 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 154.1; 145.8; 144.6; 131.4; 126.8; 117.4; 110.6; 105.4; 83.4; 82.3; 62.7; 14.8; 14.5. Anal. calc. for $C_{13}H_{12}N_2O_2$: C 68.41, H 5.30, N 12.27; found: C 68.53, H 5.29, N 12.14.

*2-Methyl-6-[(trimethylsilyl)ethynyl]imidazo[1,2-*a*]pyridine* (**3d**). Prepared according to *Method A*; purified by FC (SiO_2; PE). Yield: 74%. M.p. 85–86°. ^{1}H-NMR: 8.24 (*m*, H–C(5)); 7.45 (*d*, *J* = 9.3, H–C(8)); 7.32 (*s*, H–C(3)); 7.16 (*dd*, *J* = 9.3, 1.5, H–C(7)); 2.48 (*s*, Me); 0.28 (*s*, 3 Me). ^{13}C-NMR: 144.9; 144.4; 129.9; 127.3; 117.0; 110.2; 108.9; 101.5; 96.0; 14.8; 0.30. Anal. calc. for $C_{13}H_{16}N_2Si$: C 68.37, H 7.06, N 12.27; found: C 68.53, H 7.12, N 12.14.

*2-(4-Fluorophenyl)-6-(phenylethynyl)imidazo[1,2-*a*]pyridine* (**3e**). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 92%. M.p. 211–212°. ^{1}H-NMR: 8.36 (*m*, H–C(5)); 7.95 (*dd*, *J* = 8.8, 5.5, H–C(2,6) of C_6H_4F); 7.81 (*s*, H–C(3)); 7.62 (*d*, *J* = 9.4, H–C(8)); 7.57 (*m*, H–C(2,6) of C_6H_5); 7.42 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.31 (*dd*, *J* = 9.4, 1.6, H–C(7)); 7.15 (*t*, *J* = 8.8, H–C(3,5) of C_6H_4F). ^{13}C-NMR: 163.3 (*J* = 246); 146.2; 145.0; 132.0; 130.0; 129.1; 128.9; 128.7; 128.3; 128.2 (*J* = 8); 123.0; 117.5; 116.2 (*J* = 21.5); 109.8; 108.4; 91.2; 85.8. Anal. calc. for $C_{21}H_{13}FN_2$: C 80.75, H 4.20, N 8.97; found: C 80.98, H 4.19, N 9.03.

*2-(4-Fluorophenyl)-6-(3-hydroxyprop-1-ynyl)imidazo[1,2-*a*]pyridine* (= *3-[2-(4-Fluorophenyl)imidazo[1,2-*a*]pyridin-6-yl]prop-2-yn-1-ol*; **3f**)[2]. Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 92%. M.p. 185–186°. ^{1}H-NMR: 8.77 (*s*, H–C(5)); 8.37 (*s*, H–C(3)); 8.02 (*dd*, *J* = 8.8, 5.7, C(2,6) of C_6H_4F); 7.59 (*d*, *J* = 9.2, H–C(8)); 7.29 (*t*, *J* = 8.8, H–C(3,5) of C_6H_4F); 7.23 (*d*, *J* = 9.2, H–C(7)); 5.44 (*t*, *J* = 5.9, OH); 4.36 (*d*, *J* = 5.9, CH_2). ^{13}C-NMR: 162.8 (*J* = 243); 145.2; 144.5; 130.8; 130.6; 128.5 (*J* = 8); 128.3; 117.5; 116.5 (*J* = 21); 110.2; 108.6; 91.6; 81.1; 50.3. Anal. calc. for $C_{16}H_{11}FN_2O$: C 72.17, H 4.16, N 10.52; found: C 72.45, H 4.19, N 10.68.

*2-(4-Fluorophenyl)-6-[(trimethylsilyl)ethynyl]imidazo[1,2-*a*]pyridine* (**3h**). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 83%. M.p. 198–199°. ^{1}H-NMR: 8.33 (*m*, H–C(5)); 7.95 (*dd*, *J* = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.80 (*s*, H–C(3)); 7.57 (*d*, *J* = 9.3, H–C(8)); 7.24 (*dd*, *J* = 9.3,

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[2]) Systematic name in parenthesis. The atom numbering of the imidazo[1,2-*a*]pyridine core is used for the anal. data.

1.6, H–C(7)); 7.17 (*t*, *J* = 8.8, H–C(3,5) of C_6H_4F); 0.31 (*s*, 3 Me). ^{13}C-NMR: 161.9 (*J* = 245.5); 144.9; 143.6; 128.6; 128.0; 127.0; 126.8 (*J* = 8.5); 116.0; 114.8 (*J* = 21); 108.3; 106.9; 99.9; 95.3; 0.20. Anal. calc. for $C_{18}H_{17}FN_2Si$: C 70.10, H 5.56, N 9.08; found: C 70.35, H 5.44, N 9.13.

*Ethyl 6-(Phenylethynyl)imidazo[1,2-*a*]pyridine-2-carboxylate* (**3i**). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 87%. M.p. 157–158°. ^{1}H-NMR: 8.37 (*m*, H–C(5)); 8.20 (*s*, H–C(3)); 7.68 (*d*, *J* = 9.4, H–C(8)); 7.56 (*m*, H–C(2,6) of C_6H_5); 7.41 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.36 (*dd*, *J* = 9.4, 1.7, H–C(7)); 4.50 (*q*, *J* = 7.1, CH_2); 1.47 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.5; 144.5; 138.0; 132.1; 129.5; 129.4; 129.1; 128.9; 122.6; 119.1; 117.5; 111.5; 92.1; 85.1; 61.7; 14.9. Anal. calc. for $C_{18}H_{14}N_2O_2$: C 74.47, H 4.86, N 9.65; found: C 74.45, H 4.89, N 9.68.

*Ethyl 6-(3-Hydroxyprop-1-yn-1-yl)imidazo[1,2-*a*]pyridine-2-carboxylate* (**3j**). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2/MeOH 95:5). Yield: 92%. M.p. 172–173°. ^{1}H-NMR: 8.79 (*m*, H–C(5)); 8.53 (*s*, H–C(3)); 7.65 (*d*, *J* = 9.4, H–C(8)); 7.32 (*dd*, *J* = 9.4, 1.4, H–C(7)); 5.45 (*t*, *J* = 5.9, OH); 4.33 (*m*, 2 CH_2); 1.34 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.3; 144.2; 137.0; 131.3; 129.6; 119.2; 118.8; 109.8; 92.4; 80.5; 61.2; 50.3; 15.1. Anal. calc. for $C_{13}H_{12}N_2O_3$: C 63.93, H 4.95, N 11.47; found: C 94.07, H 5.19, N 11.38.

*Ethyl 6-(3-Ethoxy-3-oxoprop-1-yn-1-yl)imidazo[1,2-*a*]pyridine-2-carboxylate* (**3k**). Prepared according to *Method A*, but for 5 h at 60°; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 37%. M.p. 128–129°. ^{1}H-NMR: 8.51 (*m*, H–C(5)); 8.23 (*s*, H–C(3)); 7.72 (*d*, *J* = 9.5, H–C(8)); 7.35 (*dd*, *J* = 9.5, 1.6, H–C(7)); 4.50 (*q*, *J* = 7.1, CH_2); 4.35 (*q*, *J* = 7.1, CH_2); 1.48 (*t*, *J* = 7.1, Me); 1.41 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.3; 153.8; 144.6; 138.7; 132.2; 128.7; 119.6; 117.8; 107.9; 83.1; 81.8; 62.9; 61.9; 14.8; 14.5. Anal. calc. for $C_{15}H_{14}N_2O_4$: C 62.93, H 4.93, N 9.79; found: C 62.99, H 4.86, N 9.71.

*Ethyl 6-[(Trimethylsilyl)ethynyl]imidazo[1,2-*a*]pyridine-2-carboxylate* (**3l**). Prepared according to *Method A*; purified by FC (SiO_2; Et_2O). Yield: 83%. M.p. 156–157°. ^{1}H-NMR: 8.32 (*s*, H–C(5)); 8.16 (*s*, H–C(3)); 7.63 (*d*, *J* = 9.3, H–C(8)); 7.27 (*d*, *J* = 9.3, H–C(7)); 4.49 (*q*, *J* = 7.1, CH_2); 1.46 (*t*, *J* = 7.1, Me); 0.30 (*s*, 3 Me). ^{13}C-NMR: 163.4; 144.5; 138.1; 129.8; 129.6; 119.0; 117.4; 111.3; 100.4; 97.9; 61.7; 14.8; 0.20. Anal. calc. for $C_{15}H_{18}N_2O_2Si$: C 62.90, H 6.33, N 9.78; found: C 62.95, H 6.36, N 9.74.

*2,6-Dimethyl-8-(phenylethynyl)imidazo[1,2-*a*]pyridine* (**4a**). Prepared according to *Method A*; purified by FC (SiO_2; Et_2O). Yield: 83%. M.p. 101–102°. ^{1}H-NMR: 7.83 (*m*, H–C(5)); 7.67 (*m*, H–C(2,6) of C_6H_5); 7.59 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.31 (*s*, H–C(3)); 7.26 (*d*, *J* = 1, H–C(7)); 2.52 (*s*, Me); 2.31 (*s*, Me). ^{13}C-NMR: 144.0; 143.9; 132.4; 131.6; 128.9; 128.7; 123.7; 123.4; 121.4; 112.1; 110.5; 95.2; 85.1; 18.2; 14.9. Anal. calc. for $C_{17}H_{14}N_2$: C 82.90, H 5.73, N 11.37; found: C 83.24, H 6.06, N 11.02.

*2,6-Dimethyl-8-(3-hydroxyprop-1-yn-1-yl)imidazo[1,2-*a*]pyridine* (= *3-(2,6-Dimethylimidazo[1,2-*a*]pyridin-8-yl)prop-2-yn-1-ol*; **4b**)[2]). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2/MeOH 95:5). Yield: 81%. M.p. 166–167°. ^{1}H-NMR: 7.91 (*s*, H–C(5)); 7.23 (*s*, H–C(3)); 7.14 (*d*, *J* = 1.4, H–C(7)); 5.33 (*t*, *J* = 5.2, OH); 4.66 (*d*, *J* = 5.2, CH_2); 2.49 (*s*, Me); 2.29 (*s*, Me). ^{13}C-NMR: 144.1; 143.6; 131.0; 123.5; 121.6; 111.6; 110.4; 94.9; 80.4; 51.6; 18.3; 14.7. Anal. calc. for $C_{12}H_{12}N_2O$: C 71.98, H 6.04, N 13.99; found: C 72.35, H 6.07, N 14.05.

*2,6-Dimethyl-8-[(trimethylsilyl)ethynyl]imidazo[1,2-*a*]pyridine* (**4d**). Prepared according to *Method A*; purified by FC (SiO_2; Et_2O). Yield: 54%. M.p. 84–85°. ^{1}H-NMR: 7.84 (*m*, H–C(5)); 7.30 (*s*, H–C(3)); 7.25 (*d*, *J* = 1.2, H–C(7)); 2.50 (*s*, Me); 2.29 (*s*, Me); 0.24 (*s*, 3 Me). ^{13}C-NMR: 144.1; 143.9; 132.6; 123.8; 121.2; 111.9; 110.5; 100.9; 100.1; 18.2; 14.9; 0.4. Anal. calc. for $C_{14}H_{18}N_2Si$: C 69.37, H 7.48, N 11.56; found: C 69.54, H 7.49, N 11.47.

*2-(4-Fluorophenyl)-6-methyl-8-(phenylethynyl)imidazo[1,2-*a*]pyridine* (**4e**). Prepared according to *Method A*; purified by FC (Al_2O_3; Et_2O/PE 75:25). Yield: 94%. M.p. 156–157°. ^{1}H-NMR: 8.01 (*dd*, *J* = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.89 (*m*, H–C(5)); 7.77 (*s*, H–C(3)); 7.73 (*m*, H–C(2,6) of C_6H_5); 7.42 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.32 (*d*, *J* = 1.5, H–C(7)); 7.15 (*t*, *J* = 8.8, H–C(3,5) of C_6H_4F); 2.34 (*s*, Me). ^{13}C-NMR: 163.1 (*J* = 245.5); 145.3; 144.5; 132.4; 132.1; 130.3 (*J* = 3.5); 129.1; 128.7; 128.3 (*J* = 8); 124.0; 123.4; 122.2; 115.9 (*J* = 21.5); 112.8; 108.8; 95.8; 84.9; 18.4. Anal. calc. for $C_{22}H_{15}FN_2$: C 80.96; H 4.63, N 8.58; found: C 81.22, H 4.71, N 8.56.

*2-(4-Fluorophenyl)-8-(3-hydroxyprop-1-yn-1-yl)-6-methylimidazo[1,2-*a*]pyridine* (= *3-[2-(4-Fluorophenyl)-6-methylimidazo[1,2-*a*]pyridin-8-yl]prop-2-yn-1-ol*; **4f**)[2]). Prepared according to *Method A*; purified by FC (SiO_2; CH_2Cl_2/Et_2O 1:1). Yield: 87%. M.p. 181–182°. ^{1}H-NMR: 8.35 (*s*, H–C(3),

H–C(5)); 8.02 (*dd*, *J* = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.29 (*t*, *J* = 8.7, H–C(3,5) of C_6H_4F); 7.28 (*s*, H–C(7)); 5.51 (*t*, *J* = 5.9, OH); 4.45 (*d*, *J* = 5.9, CH_2); 2.28 (*s*, Me). ^{13}C-NMR: 162.7 (*J* = 243); 144.3 (2C); 132.7; 131.2; 128.4 (*J* = 8); 125.7; 122.2; 116.4 (*J* = 21.5); 111.7; 110.5; 95.7; 80.3; 50.6; 18.1. Anal. calc. for $C_{17}H_{13}FN_2O$: C 72.84, H 4.67, N 9.99; found: C 72.88, H 4.68, N 9.97.

*Ethyl 3-[2-(4-Fluorophenyl)-6-methylimidazo[1,2-*a*]pyridin-8-yl]prop-2-ynoate* (**4g**). Prepared according to *Method A*; purified by FC (Al_2O_3; Et_2O/PE 1:1). Yield: 49%. M.p. 107–108°. ^{1}H-NMR: 8.00 (*m*, H–C(5)); 7.98 (*dd*, *J* = 8.9, 5.4, H–C(2,6) of C_6H_4F); 7.78 (*s*, H–C(3)); 7.40 (*d*, *J* = 1.5, H–C(7)); 7.15 (*t*, *J* = 8.9, H–C(3,5) of C_6H_4F); 4.38 (*q*, *J* = 7.1, CH_2); 2.35 (*s*, Me); 1.42 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.2 (*J* = 245.5); 154.3; 145.9; 144.1; 134.8; 129.8; 128.4; 126.1; 122.1; 116.0 (*J* = 21.5); 109.1; 108.9; 85.9; 81.5; 62.8; 18.2; 14.5. Anal. calc. for $C_{19}H_{15}FN_2O_2$: C 70.80, H 4.69, N 8.69; found: C 70.85, H 4.73, N 8.54.

*2-(4-Fluorophenyl)-6-methyl-8-[(trimethylsilyl)ethynyl]imidazo[1,2-*a*]pyridine* (**4h**). Prepared according to *Method A*; purified by FC (SiO_2; CH_2Cl_2). Yield: 81%. M.p. 165–166°. ^{1}H-NMR: 7.99 (*dd*, *J* = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.89 (*m*, H–C(5)); 7.75 (*s*, H–C(3)); 7.27 (*d*, *J* = 1.6, H–C(7)); 7.13 (*t*, *J* = 8.8, H–C(3,5) of C_6H_4F); 2.33 (*s*, Me); 0.33 (*s*, 3 Me). ^{13}C-NMR: 163.1 (*J* = 245); 145.5; 144.7; 132.9; 130.4; 128.3 (*J* = 8); 124.1; 122.0; 115.9 (*J* = 21.5); 112.7; 108.5; 101.6; 99.9; 18.2; 0.38. Anal. calc. for $C_{19}H_{19}FN_2Si$: C 70.77, H 5.94, N 8.69; found: C 70.89, H 6.01, N 8.84.

*Ethyl 6-Methyl-8-(phenylethynyl)imidazo[1,2-*a*]pyridine-2-carboxylate* (**4i**). Prepared according to *Method A*; purified by FC (SiO_2; Et_2O). Yield: 85%. M.p. 102–103°. ^{1}H-NMR: 8.16 (*s*, H–C(3)); 7.94 (*s*, H–C(5)); 7.68 (*m*, H–C(2,6) of C_6H_5); 7.40 (*m*, H–C(3,5) and H–C(4) of C_6H_5, H–C(7)); 4.52 (*q*, *J* = 7.1, CH_2); 2.37 (*s*, Me); 1.47 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.6; 144.3; 137.3; 135.6; 133.5; 129.2; 128.7; 124.0; 123.8; 123.1; 117.9; 114.7; 92.1; 85.1; 61.7; 14.9. Anal. calc. for $C_{19}H_{16}N_2O_2$: C 74.98, H 5.30, N 9.20; found: C 75.03, H 5.29, N 9.17.

*Ethyl 8-(3-Hydroxyprop-1-yn-1-yl)-6-methylimidazo[1,2-*a*]pyridine-2-carboxylate* (**4j**). Prepared according to *Method A*; purified by FC (Al_2O_3; CH_2Cl_2/MeOH 95:5). Yield: 74%. M.p. 186–187°. ^{1}H-NMR: 8.51 (*s*, H–C(3)); 8.39 (*s*, H–C(5)); 7.40 (*d*, *J* = 1.1, H–C(7)); 5.52 (br. *s*, OH); 4.43 (br. *s*, CH_2); 4.34 (*q*, *J* = 7.2, CH_2); 2.28 (*s*, Me); 1.34 (*t*, *J* = 7.2, Me). ^{13}C-NMR: 163.4; 143.9; 136.2; 134.2; 126.1; 123.5; 119.4; 112.9; 96.4; 79.6; 61.1; 50.5; 18.1; 15.2. Anal. calc. for $C_{14}H_{14}N_2O_3$: C 65.11, H 5.46, N 10.85; found: C 65.47, H 5.79, N 11.12.

*Ethyl 6-Methyl-8-[(Trimethylsilyl)ethynyl]imidazo[1,2-*a*]pyridine-2-carboxylate* (**4l**). Prepared according to *Method A*; purified by FC (SiO_2; Et_2O). Yield: 79%. M.p. 126–127°. ^{1}H-NMR: 8.14 (*s*, H–C(3)); 7.93 (*m*, H–C(5)); 7.36 (*d*, *J* = 1.4, H–C(7)); 4.46 (*q*, *J* = 7.1, CH_2); 2.34 (*s*, Me); 1.46 (*t*, *J* = 7.1, Me); 0.29 (*s*, 3 Me). ^{13}C-NMR: 163.7; 144.2; 137.3; 134.7; 124.3; 123.7; 117.9; 114.4; 102.8; 99.0; 61.6; 18.3; 14.7; 0.58. Anal. calc. for $C_{16}H_{20}N_2O_2Si$: C 63.97, H 6.71, N 9.32; found: C 64.28, H 6.82, N 9.24.

*2-(4-Fluorophenyl)-3-(phenylethynyl)imidazo[1,2-*a*]pyridine* (**8a**). Prepared according to *Method B*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 75%. M.p. 119–120°. ^{1}H-NMR: 8.41 (*m*, H–C(2,6) of C_6H_4F, H–C(5)); 7.71 (*dt*, *J* = 9, 1, H–C(8)); 7.64 (*m*, H–C(2,6) of C_6H_5); 7.47 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.34 (*ddd*, *J* = 9, 6.8, 1, H–C(7)); 7.22 (*t*, *J* = 8.7, H–C(3,5) of C_6H_4F); 6.99 (*td*, *J* = 6.8, 1, H–C(6)). ^{13}C-NMR: 163.5 (*J* = 248); 147.6; 145.7; 131.7 (2 arom. C); 130.2 (*J* = 3); 129.5 (*J* = 8); 129.3; 129.1 (2 arom. C); 126.9; 125.6; 123.1; 117.9; 116,0 (*J* = 21.5); 113.5; 104.9; 101.8; 78.5. Anal. calc. for $C_{21}H_{13}FN_2$: C 80.75, H 4.20, N 8.97; found: C 80.88, H 4.14, N 8.92.

*Ethyl 3-(Phenylethynyl)imidazo[1,2-*a*]pyridine-2-carboxylate* (**8b**). Prepared according to *Method C*; purified by FC (Al_2O_3; CH_2Cl_2). Yield: 64%. M.p. 108–109°. ^{1}H-NMR: 8.42 (*d*, *J* = 6.9, H–C(5)); 7.77 (*d*, *J* = 9.1, H–C(8)); 7.67 (*m*, H–C(2,6) of C_6H_5); 7.42 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.33 (*m*, H–C(7)); 7.05 (*t*, *J* = 6.8, H–C(6)); 4.55 (*q*, *J* = 7.1, CH_2); 1.51 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 162.9; 145.1; 138.8; 132.0 (2 arom. C); 129.6; 129.0 (2 arom. C); 127.9; 125.9; 122.6; 119.6; 114.8; 112.7; 102.4; 76.8; 61.8; 14.9. Anal. calc. for $C_{18}H_{14}N_2O_2$: C 74.47, H 4.86, N 9.65; found: C 74.53, H 4.91, N 9.66.

*8-Bromo-2-(4-fluorophenyl)-6-methyl-3-(phenylethynyl)imidazo[1,2-*a*]pyridine* (**8c**). Prepared according to *Method A*; purified by FC (SiO_2; CH_2Cl_2). Yield: 30%. M.p. 150°. ^{1}H-NMR: 8.39 (*dd*, *J* = 8.6, 5.6, H–C(2,6) of C_6H_4F); 8.04 (br. *s*, H–C(5)); 7.62 (*m*, H–C(2,6) of C_6H_5); 7.44 (*m*, H–C(3,5) and H–C(4) of C_6H_5); 7.39 (*s*, H–C(7)); 7.18 (*t*, *J* = 8.6, H–C(3,5) of C_6H_4F); 2.38 (*s*, Me). ^{13}C-NMR: 163.3 (*J* = 244.6); 147.6; 142.4; 131.9; 131.7 (2 arom. C); 129.8; 129.6 (*J* = 8); 129.3, 129.0 (2 arom. C); 123.5; 122.8; 122.7; 115.8 (*J* = 21); 111.2; 106.6; 101.8; 78.4; 18.5.

General Procedure for Desilylation. To a stirred soln. of **3d**,**h**,**l** or **4d**,**h**,**l** (0.35 mmol) in THF (1 ml) was added TBAF (104 µl, 0.35 mmol) at r.t., and the resulting soln. was stirred for a further 10 min. After quenching the reaction by adding sat. aq. NH_4Cl soln., the org. solvent was removed by evaporation, and the residue was extracted with AcOEt, dried (Na_2SO_4), and concentrated.

*6-Ethynyl-2-(4-fluorophenyl)imidazo[1,2-*a*]pyridine* (**5a**). Purified by FC (Al_2O_3; CH_2Cl_2). Yield: 88%. M.p. 216–217°. ^{1}H-NMR: 8.35 (*m*, H–C(5)); 7.95 (*dd*, *J* = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.81 (*s*, H–C(3)); 7.59 (*d*, *J* = 9.3, H–C(8)); 7.25 (*dd*, *J* = 9.3, 1.4, H–C(7)); 7.17 (*t*, *J* = 8.7, H–C(3,5) of C_6H_4F); 3.16 (*s*, HC≡). ^{13}C-NMR: 163.3 (*J* = 245.5); 144.8; 143.6; 129.7 (2C); 128.3; 128.2 (*J* = 8); 117.6; 116.2 (*J* = 21.5); 108.7; 106.4; 80.1; 79.3. Anal. calc. for $C_{15}H_9FN_2$: C 76.26, H 3.84, N 11.86; found: C 76.32, H 3.92, N 11.89.

*6-Ethynyl-2-methylimidazo[1,2-*a*]pyridine* (**5b**). Purified by FC (Al_2O_3; CH_2Cl_2). Yield: 94%. M.p. 116–117°. ^{1}H-NMR: 8.25 (*m*, H–C(5)); 7.47 (*d*, *J* = 9.3, H–C(8)); 7.33 (*s*, H–C(3)); 7.17 (*d*, *J* = 9.3, 1.5, H–C(7)); 3.12 (*s*, HC≡); 2.48 (*s*, Me). ^{13}C-NMR: 145.0; 144.2; 129.4; 127.3; 117.0; 110.2; 107.8; 80.5; 78.8; 14.8. Anal. calc. for $C_{10}H_8N_2$: C 76.90, H 5.16, N 17.94; found: C 76.94, H 5.21, N 17.88.

*Ethyl 6-Ethynylimidazo[1,2-*a*]pyridine-2-carboxylate* (**5c**). Purified by FC (SiO_2; Et_2O). Yield: 67%. M.p. 130–131°. ^{1}H-NMR: 8.36 (*m*, H–C(5)); 8.19 (*s*, H–C(3)); 7.67 (*d*, *J* = 9.4, H–C(8)); 7.31 (*dd*, *J* = 9.4, 1.6, H–C(7)); 4.50 (*q*, *J* = 7.1, CH_2); 3.20 (*s*, HC≡); 1.47 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.4; 144.5; 138.2; 130.3; 129.4; 119.2; 117.5; 110.2; 80.3; 79.5; 61.7; 14.8. Anal. calc. for $C_{12}H_{10}N_2O_2$: C 67.28, H 4.71, N 13.08; found: C 67.33, H 4.69, N 13.07.

*8-Ethynyl-2-(4-fluorophenyl)-6-methylimidazo[1,2-*a*]pyridine* (**6a**). Purified by FC (Al_2O_3; CH_2Cl_2). Yield: 82%. M.p. 211–212°. ^{1}H-NMR: 7.99 (*dd*, *J* = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.94 (*m*, H–C(5)); 7.78 (*s*, H–C(3)); 7.29 (*d*, *J* = 1.2, H–C(7)); 7.14 (*t*, *J* = 8.8, H–C(3,5) of C_6H_4F); 3.60 (*s*, HC≡); 2.35 (*s*, Me). ^{13}C-NMR: 163.2 (*J* = 245); 145.6; 144.9; 132.9; 130.2; 128.4 (*J* = 8); 124.4; 122.0; 155.9 (*J* = 21.5); 111.6; 108.7; 83.8; 79.0; 18.3. Anal. calc. for $C_{16}H_{11}FN_2$: C 76.79, H 4.43, N 11.19; found: C 76.88, H 4.72, N 11.14.

*8-Ethynyl-2,6-Dimethylimidazo[1,2-*a*]pyridine* (**6b**). Purified by FC (SiO_2; Et_2O). Yield: 89%. M.p. 72–73°. ^{1}H-NMR: 7.86 (*m*, H–C(5)); 7.31 (*s*, H–C(3)); 7.24 (*s*, H–C(7)); 3.50 (*s*, HC≡); 2.50 (*s*, Me); 2.31 (*s*, Me). ^{13}C-NMR: 144.2; 132.4; 132.0; 124.1; 121.2; 110.8; 110.5; 83.4; 79.0; 18.2; 14.9. Anal. calc. for $C_{11}H_{10}N_2$: C 77.62, H 5.92, N 16.46; found: C 77.78, H 5.97, N 16.40.

*Ethyl 8-Ethynyl-6-methylimidazo[1,2-*a*]pyridine-2-carboxylate* (**6c**). Purified by FC (Al_2O_3; Et_2O). Yield: 86%. M.p. 140–141°. ^{1}H-NMR: 8.16 (*s*, H–C(3)); 7.96 (*m*, H–C(5)); 7.37 (*d*, *J* = 1.4, H–C(7)); 4.48 (*q*, *J* = 7.1, CH_2); 3.55 (*s*, HC≡); 2.36 (*s*, Me); 1.46 (*t*, *J* = 7.1, Me). ^{13}C-NMR: 163.6; 144.5; 137.5; 134.4; 124.6; 123.7; 117.9; 113.5; 85.0 (2 C); 61.6; 18.4; 14.8. Anal. calc. for $C_{13}H_{12}N_2O_2$: C 68.41, H 5.30, N 12.27; found: C 68.54, H 5.24, N 12.33.

Typical Procedure for the Preparation of Compounds **5a**,**c** *and* **9a**,**d**. [$Pd(PPh_3)_4$] (69 mg, 6 mol-%) and tributyl(ethynyl)stannane (0.57 g, 1.8 mmol) or allenyl(tributyl)stannane (0.59 g, 1.8 mmol) in DMF (5 ml) were added dropwise to a soln. of the appropriate starting material (**1a**, **1d**, **1e**, or **1g**; 1 mmol) in DMF (35 ml). The mixture was stirred at 80° for 4 h, and then diluted with Et_2O (50 ml). The org. layer was washed with sat. aq. NH_4Cl soln. (3 × 25 ml), dried ($MgSO_4$), and concentrated *in vacuo*. The crude product (**5a**,**c** or **9a**,**d**) was purified by FC (SiO_2; PE/Et_2O/Et_3N 25 : 73 : 2).

*Ethyl 3-Ethynylimidazo[1,2-*a*]pyridine-2-carboxylate* (**9a**). Colorless solid. M.p. 102–104°. ^{1}H-NMR ($CDCl_3$, 400 MHz): 8.40 (*d*, *J* = 6.9, H–C(5)); 7.78 (*d*, *J* = 9.2, H–C(8)); 7.30 (*dd*, *J* = 9.1, 6.9, H–C(7)); 7.0 (*t*, *J* = 6.9, H–C(6)); 4.55 (*q*, *J* = 7.2, CH_2); 2.10 (*s*, HC≡); 1.50 (*t*, *J* = 7.2, Me). ^{13}C-NMR ($CDCl_3$, 100 MHz): 163.0; 144.2; 139.1; 128.3; 126.1; 119.7; 115.2; 113.1; 90.1; 79.0; 61.2; 14.3. EI-MS: 214 (58, M^+); 169 (27); 143 (100). HR-EI-MS: 214.0748 (M^+, $C_{12}H_{10}N_2O_2^+$; calc. 214.0742).

*3-Ethynyl-2-(4-Fluorophenyl)imidazo[1,2-*a*]pyridine* (**9b**). Colorless solid. M.p. 196–198°. ^{1}H-NMR ($CDCl_3$, 400 MHz): 8.34 (*d*, *J* = 6.8, H–C(5)); 7.70 (*dd*, *J* = 8.8, 5.4, H–C(2,6) of C_6H_4F); 7.62 (*d*, *J* = 9.2, H–C(8)); 7.36 (*dd*, *J* = 9.2, 6.8, H–C(7)); 7.20–7.06 (*m*, H–C(3,5) of C_6H_4F); 6.99 (*t*, *J* = 6.8, H–C(6)); 1.91 (*s*, HC≡). ^{13}C-NMR ($CDCl_3$, 100 MHz): 162.5 (*J* = 246); 147.5; 145.5; 129.0; 126.8; 124.8; 124.5; 117.5; 115.4 (*J* = 21); 113.3; 107.5, 89.2; 78.0. EI-MS: 236 (M^+, 100); 141 (43); 117 (72). HR-EI-MS: 236.0756 (M^+, $C_{15}H_9FN_2^+$; calc. 236.0750).

*2-(4-Fluorophenyl)-6-prop-1-yn-1-ylimidazo[1,2-*a*]pyridine* (**9c**). Colorless solid. M.p. 164–166°. ^{1}H-NMR ($CDCl_3$, 400 MHz): 8.14 (br. *s*, H–C(5)); 7.89 (*dd*, *J* = 8.7, 5.4, H–C(2,6) of C_6H_4F); 7.70 (*s*, H–C(3)); 7.51 (*d*, *J* = 9.2, H–C(8)); 7.15–7.09 (*m*, H–C(3,5) of C_6H_4F, H–C(7)); 2.06 (*s*, *Me*–C≡).

^{13}C-NMR ($CDCl_3$, 100 MHz): 162.5 ($J = 246$); 145.2; 144.2; 129.4; 128.0; 127.6; 127.4 ($J = 8$); 116.6; 115.4 ($J = 21.6$); 109.8; 107.5; 87.2; 75.4; 29.4. EI-MS: 250 (100, M^+), 211 (61), 155 (66). HR-EI-MS: 250.0910 (M^+, $C_{16}H_{11}FN_2^+$; calc. 250.0906).

*Ethyl 3-Prop-1-yn-1-ylimidazo[1,2-*a*]pyridine-2-carboxylate* (**9d**). Colorless solid. M.p. 58–60°. ^{1}H-NMR: 8.31 (*dd*, *J* = 8, 2, H–C(5)); 7.70 (*dd*, *J* = 10, 2, H–C(8)); 7.32 (*m*, H–C(7)); 6.97 (*td*, *J* = 8, 2, H–C(6)); 4.51 (*q*, *J* = 7.2, CH_2); 2.31 (*s*, *Me*–C≡); 1.47 (*t*, *J* = 7.2, Me). ^{13}C-NMR: 163.1; 145.3; 139.1; 128.3; 126.2; 119.8; 115.2; 113.3; 89.3; 77.3; 61.6; 29.4; 15.1. EI-MS: 228 (37, M^+), 183 (45), 143 (100). HR-EI-MS: 228.0904 (M^+, $C_{13}H_{12}N_2O_2^+$; calc. 228.0899).

*3-[2-(4-Fluorophenyl)imidazo[1,2-*a*]pyridin-6-yl]-*N,N*-bis(1-methylethyl)prop-2-yn-1-amine* (**10a**). Into a three-necked round-bottom flask were introduced **1a** (800 mg, 2.4 mmol), [$Pd(PPh_3)_4$] (160 mg, 6 mol-%), CuI (45 mg, 10 mol-%), N_2-sat. (i-Pr)$_2$NH (4 ml, 28.8 mmol), *N,N*-bis(1-methylethyl)prop-2-yn-1-amine (422 mg, 3.1 mmol) and THF (5 ml). The mixture was stirred at r.t. for 1 h. The product was purified by FC (Al_2O_3; CH_2Cl_2). Yield: 81%. M.p. 150–152°. ^{1}H-NMR ($CDCl_3$, 500 MHz): 8.20 (*s*, H–C(5)); 7.91 (*dd*, *J* = 8, 5.5, H–C(2,6) of C_6H_4F); 7.76 (*s*, H–C(3)); 7.53 (*d*, *J* = 9.5, H–C(8)); 7.14 (*m*, H–C(3,5) of C_6H_4F, H–C(7)); 3.66 (*s*, NCH_2); 3.28 (*t*, *J* = 6.5, 2 CH); 1.17 (*d*, *J* = 6.5, 4 Me). ^{13}C-NMR ($CDCl_3$, 100.6 MHz): 162.5 (*J* = 247); 145.4; 144.3; 129.4; 127.7 (2 C); 127.5 (*J* = 8); 116.7; 115.4 (*J* = 21.6); 109.4; 107.5; 90.4; 79.2; 48.4; 34.6; 20.4.

*Ethyl 6-{3-[Bis(1-methylethyl)amino]prop-1-yn-1-yl}imidazo[1,2-*a*]pyridine-2-carboxylate* (**10b**). Into a three-necked round-bottom flask were introduced **1g** (1 g, 3.2 mmol), [$Pd(PPh_3)_4$] (220 mg, 6 mol-%), CuI (60 mg, 10 mol-%), N_2-sat. (i-Pr)$_2$NH (5.4 ml, 38.9 mmol), *N,N*-bis(1-methylethyl)prop-2-yn-1-amine (650 mg, 4.8 mmol), and THF (6 ml). The mixture was stirred at r.t. for 1 h, and the product was purified by FC (SiO_2; AcOEt). Yield: 75%. M.p. 67°. ^{1}H-NMR ($CDCl_3$, 500 MHz): 8.20 (*s*, H–C(5)); 8.13 (*s*, H–C(3)); 7.59 (*d*, *J* = 9.5, H–C(8)); 7.21 (*d*, *J* = 9.5, H–C(7)); 4.46 (*q*, *J* = 7.5, CH_2); 3.65 (*s*, CH_2); 3.26 (*m*, 2 CH); 1.44 (*t*, *J* = 7.5, Me); 1.16 (*d*, *J* = 6.5, 4 Me). ^{13}C-NMR: 163.4; 144.5; 138.0; 129.7; 128.8; 118.9; 117.3; 111.7; 92.3; 79.3; 61.6; 49.1; 35.3; 21; 14.8.

*Ethyl 3-{3-[Bis(1-methylethyl)amino]prop-1-yn-1-yl}imidazo[1,2-*a*]pyridine-2-carboxylate* (**12**). Into a three-necked round-bottom flask were introduced **1e** (1 g, 3.2 mmol), [$Pd_2(dba)_3(CHCl_3)$] (280 mg, 10 mol-%), CuI (60 mg, 10 mol-%), and *N,N*-bis(1-methylethyl)prop-2-yn-1-amine (563 mg, 4.1 mmol) in Et_3N/DMF 1:1 (6 ml). The mixture was stirred at r.t. for 24 h, and the product was purified by FC (SiO_2; AcOEt). Yield: 53%. Oil. ^{1}H-NMR: 8.17 (*d*, *J* = 6.8, H–C(5)); 7.57 (*d*, *J* = 8.5, H–C(8)); 7.20 (*dd*, *J* = 8.5, 6.8, H–C(7)); 6.87 (*t*, *J* = 6.8, H–C(6)); 4.38 (*q*, *J* = 7, CH_2); 3.76 (*s*, CH_2); 3.20 (*t*, *J* = 6.5, 2 CH); 1.34 (*t*, *J* = 7, Me); 1.08 (*d*, *J* = 6.5, 4 Me). ^{13}C-NMR: 162.8; 144.6; 138.2; 127.5; 125.6; 119.3; 114.5; 112.8; 102.9; 70.8; 61.5; 49.1; 35.7; 21.0; 14.8.

General Procedure for the Preparation of **11** *and* **13**. A mixture of **10** or **12** (200 mg), [$Pd_2(dba)_3(CHCl_3)$] (2.5 mol-%), and '1,2-bis[bis(pentafluorophenyl)phosphino]ethane'[1]) (10 mol-%) was dissolved in anh. $CHCl_3$ (3 ml) under Ar gas. The mixture was stirred at 100° for 24 h in a sealed tube. The solvent was removed under reduced pressure, and the residue was purified by FC (SiO_2; AcOEt) to afford **11** or **13**, resp.

*2-(4-Fluorophenyl)-6-propadienylimidazo[1,2-*a*]pyridine* (**11a**). Yield: 66%. M.p. 146° (dec.). ^{1}H-NMR ($CDCl_3$, 400 MHz): 7.94 (*m*, H–C(5)); 7.90 (*dd*, *J* = 8.8, 5.6, C(2,6) of C_6H_4F); 7.72 (*s*, H–C(3)); 7.56 (*d*, *J* = 9.3, H–C(8)); 7.23 (*dd*, *J* = 9.3, 1.5, H–C(7)); 7.11 (*t*, *J* = 8.8, C(3,5) of C_6H_4F); 6.12 (*t*, *J* = 6.8, CH); 5.25 (*d*, *J* = 6.8, CH_2). ^{13}C-NMR ($CDCl_3$, 100.6 MHz): 209.9; 162.4 (*J* = 247.5); 144.6 (2 C); 129.5; 127.3 (*J* = 7); 124.2; 121.8; 119.8; 116.9; 115.4 (*J* = 21.1); 107.7; 90.2; 79.9. Anal. calc. for $C_{16}H_{11}FN_2$: C 76.79, H 4.43, N 11.19; found: C 76.72, H 4.48, N 11.22.

*Ethyl 6-Propadienylimidazo[1,2-*a*]pyridine-2-carboxylate* (**11b**). Yield: 71%. M.p. 139°. ^{1}H-NMR ($CDCl_3$, 500 MHz): 8.10 (*s*, H–C(5)); 7.95 (*s*, H–C(3)); 7.58 (*d*, *J* = 9.3, H–C(8)); 7.28 (*d*, *J* = 9.3, H–C(7)); 6.11 (*t*, *J* = 7, CH); 5.24 (*d*, *J* = 7, CH_2); 4.43 (*q*, *J* = 7.5, CH_2); 1.41 (*t*, *J* = 7.5, Me). ^{13}C-NMR ($CDCl_3$, 100.6 MHz): 209.8; 162.9; 144.3; 136.7; 125.5; 122.0; 121.3; 118.4; 116.8; 90.0; 80.1; 60.8; 14.1. Anal. calc. for $C_{13}H_{12}N_2O_2$: C 68.41, H 5.30, N 12.27; found: C 68.53, H 5.24, N 12.58.

*Ethyl 3-Propadienylimidazo[1,2-*a*]pyridine-2-carboxylate* (**13**). Yield: 32%. M.p. 126°. ^{1}H-NMR ($CDCl_3$, 500 MHz): 8.76 (*d*, *J* = 7, H–C(5)); 7.71 (*d*, *J* = 9.5, H–C(8)); 7.61 (*t*, *J* = 7, CH); 7.30 (*m*, H–C(7)); 6.90 (*t*, *J* = 7, H–C(6)); 5.42 (*d*, *J* = 7.5, CH_2); 4.49 (*q*, *J* = 7, CH_2); 1.46 (*t*, *J* = 7.5, Me).

^{13}C-NMR ($CDCl_3$, 125.8 MHz): 209.4; 163.9; 144.9; 133.1; 126.2; 125.3; 120.3; 119.2; 113.7; 82.8; 80.4; 61.2; 14.5. Anal. calc. for $C_{15}H_{16}N_2O_2$: C 70.29, H 6.29, N 10.93; found: C 70.51, H 6.32, N 10.88.

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Received July 17, 2007