Chemical Science

Séminaire STEREO : RCC 17.06.13

Aromatic C–H Coupling with Hindered Arylboronic Acids by Pd/Fe Dual Catalysts

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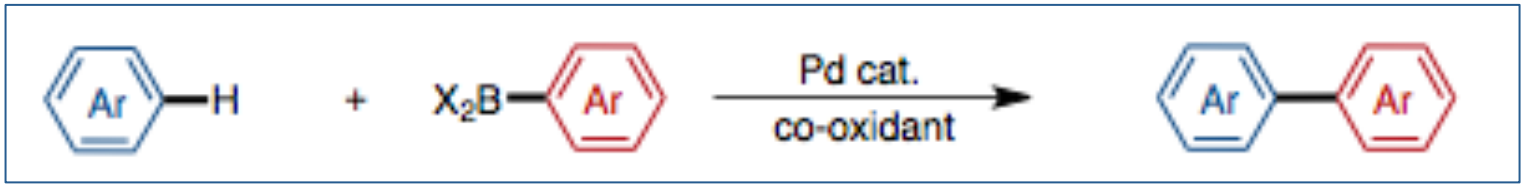
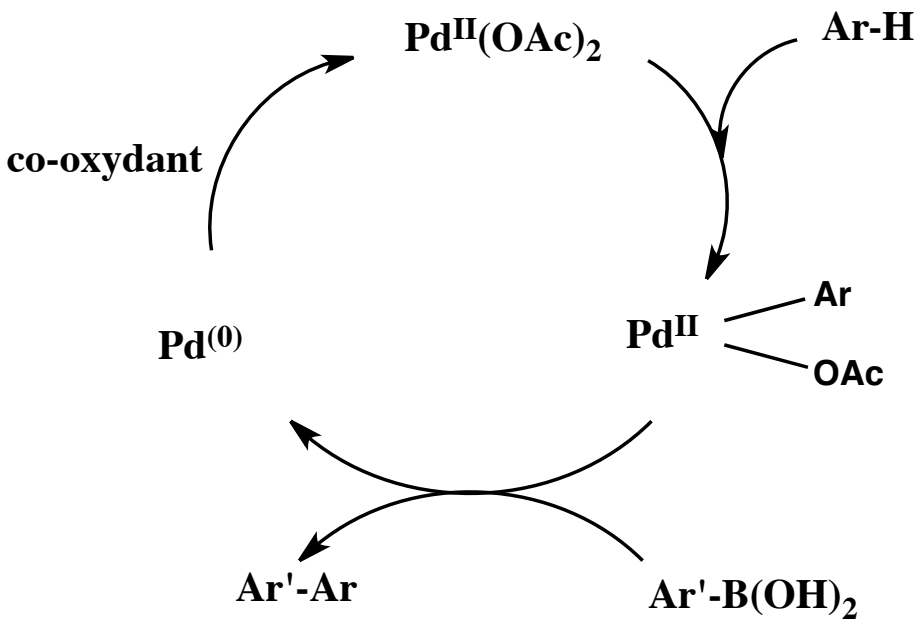
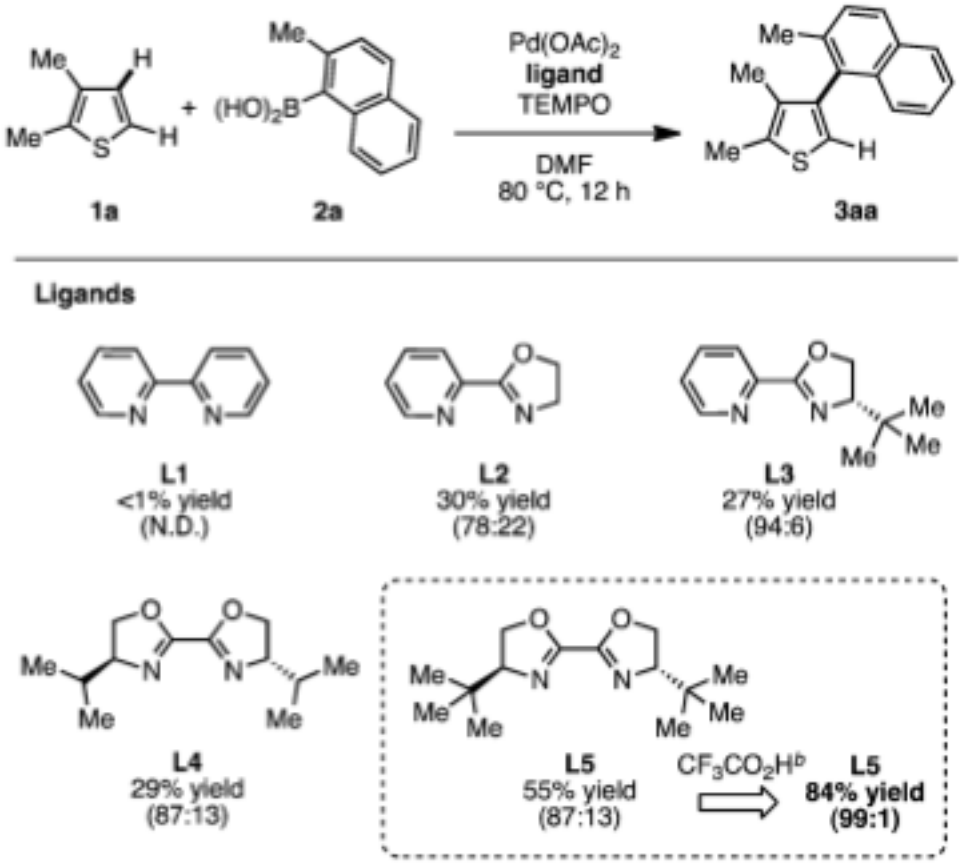
C-H Arylation





Previous work



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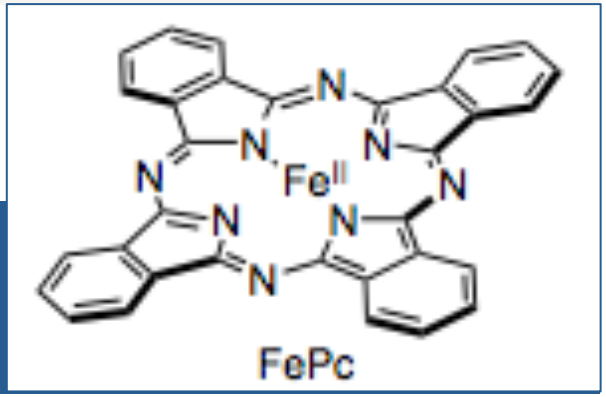
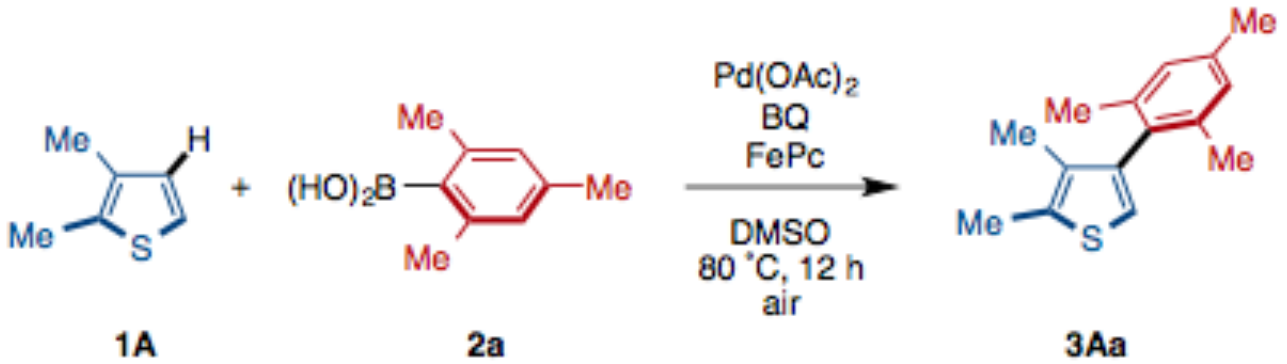
Catalytic system



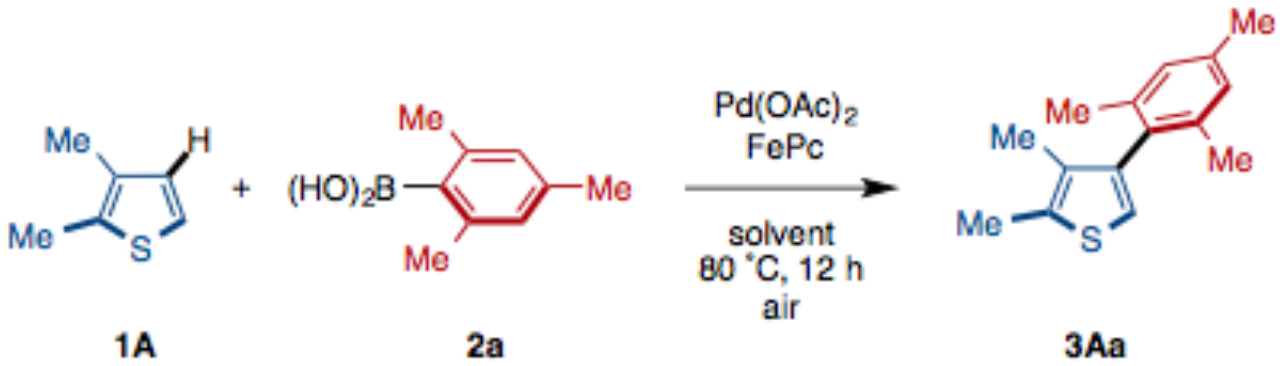
FePc



1A **2a** **3Aa**

entry	Pd(OAc)$_2$ (mol%)	BQ (mol%)	FePc (mol%)	yield (%)
1	10	100	–	83
2	10	10	5	81
3	10	10	1	46
4	10	10	–	Trace
5	10	5	5	84
6	10	–	5	83
7	–	–	5	ND
8[b]	10	–	5	10

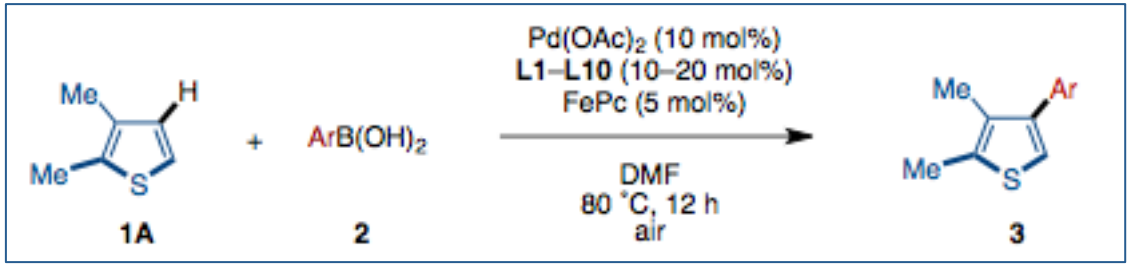
Catalytic system

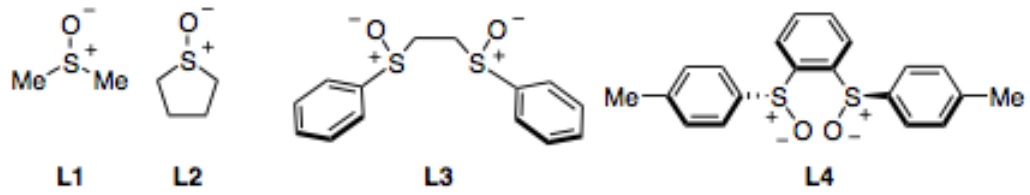


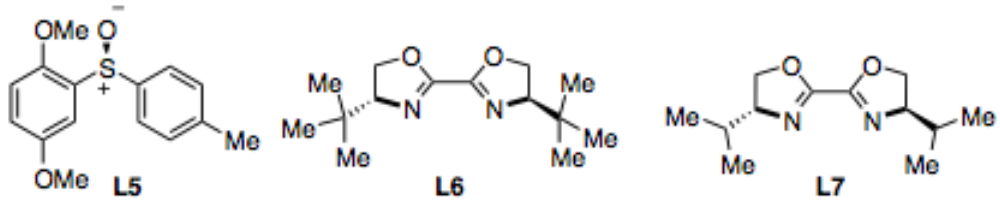
1A **2a** **3Aa**

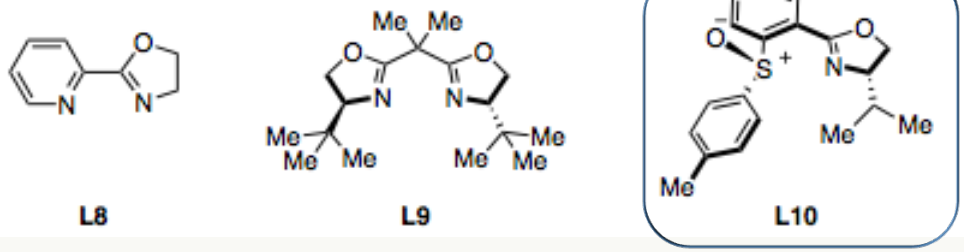
DMSO	83%
DMF	32%
DMF (100 mol% DMSO)	83%
DMF (20 mol% DMSO)	86%

Choice of the ligand

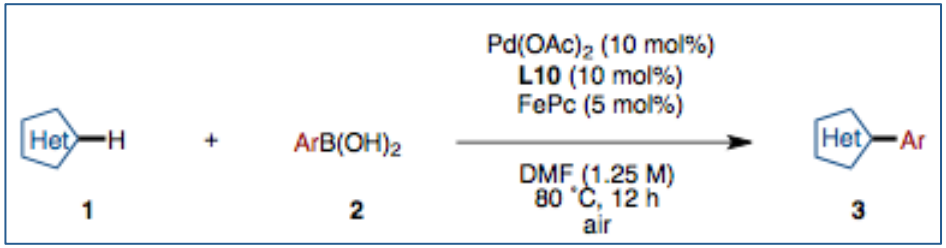


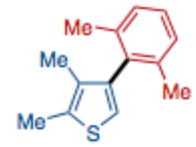


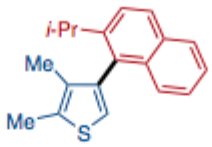


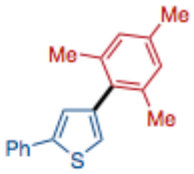


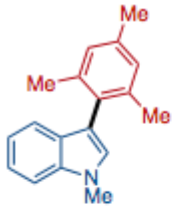
Scope of the reaction

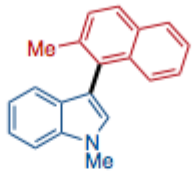


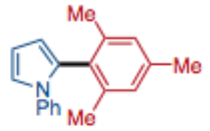

3Ac: 69%

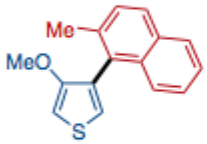

3Ad: 70%

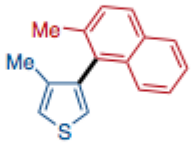

3Ba: 53%

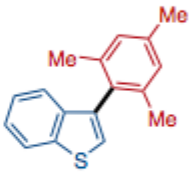

3Ha: 49%

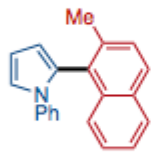

3Hb: 86%[c]

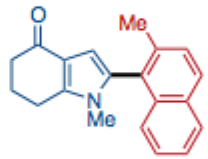

3Ia: 41%

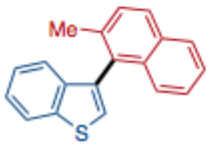

3Cb: 63%

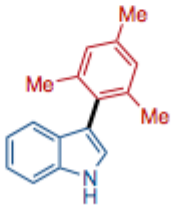

3Db: 67%


3Ea: 73%

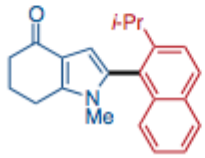

3Ib: 49%

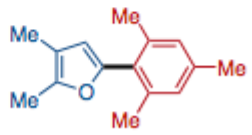

3Jb: 89%


3Eb: 80%

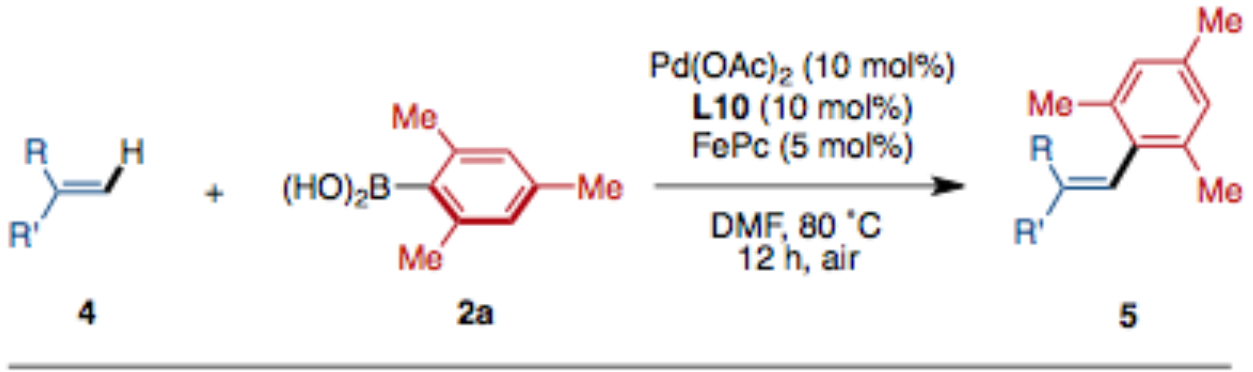

3Fa: 57%[b]

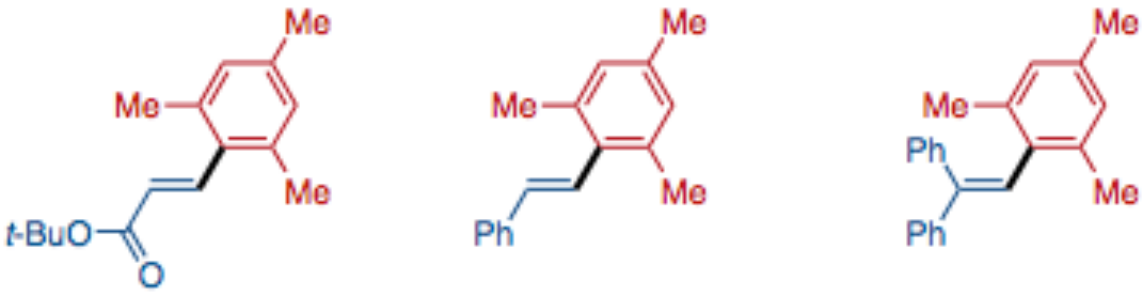

3Ga: 47%[c]


3Jd: 55%

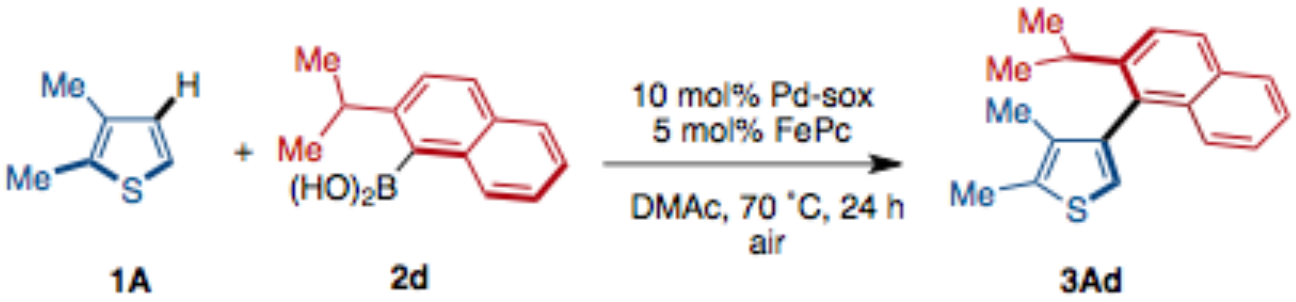

3Ka: 80%[d]

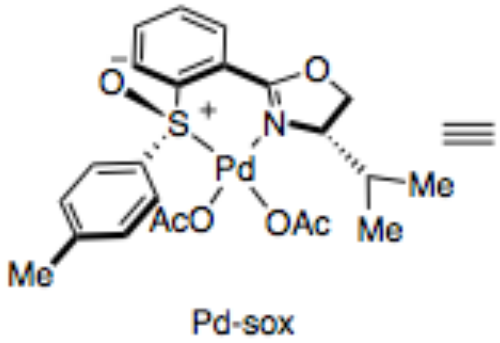
Oxidative coupling of alkenes

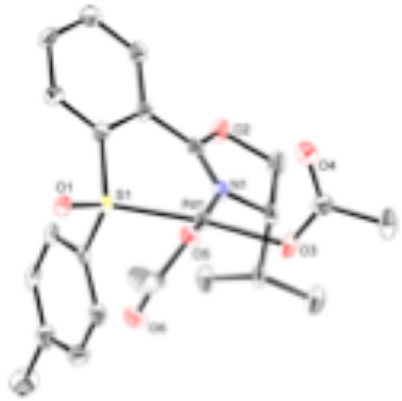




Toward an enantioselective version







Conclusion

- C-H Arylation of hindered reactants
- Dual catalyst Pd/sox/FePc
- Use of air as terminal oxidant
- Enantioselective version

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Letter

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3D Printed Bionic Ears

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Supporting Information

ABSTRACT: The ability to three-dimensionally interweave biological tissue with functional electronics could enable the creation of bionic organs possessing enhanced functionalities over their human counterparts. Conventional electronic devices are inherently two-dimensional, preventing seamless multidimensional integration with synthetic biology, as the processes and materials are very different. Here, we present a novel strategy for overcoming these difficulties via additive manufacturing of biological cells with structural and nanoparticle derived electronic elements. As a proof of concept, we generated a bionic ear via 3D printing of a cell-seeded hydrogel matrix in the anatomic geometry of a human ear, along with an intertwined conducting polymer consisting of infused silver nanoparticles. This allowed for in vitro culturing of cartilage tissue around an inductive coil antenna in the ear, which subsequently enables readout of inductively-coupled signals from cochlea-shaped electrodes. The printed ear exhibits enhanced auditory sensing for radio frequency reception, and complementary left and right ears can listen to stereo audio music. Overall, our approach suggests a means to intricately merge biologic and nanoelectronic functionalities via 3D printing.

KEYWORDS: *Cybernetics, tissue engineering, bioelectronics, cyborg organs, electronic implants, additive manufacturing*