Synthesis of Heterocycles *via* Aerobic Ni-Catalyzed Imidoylation of Aromatic 1,2-Bis-Nucleophiles with Isocyanides[1]

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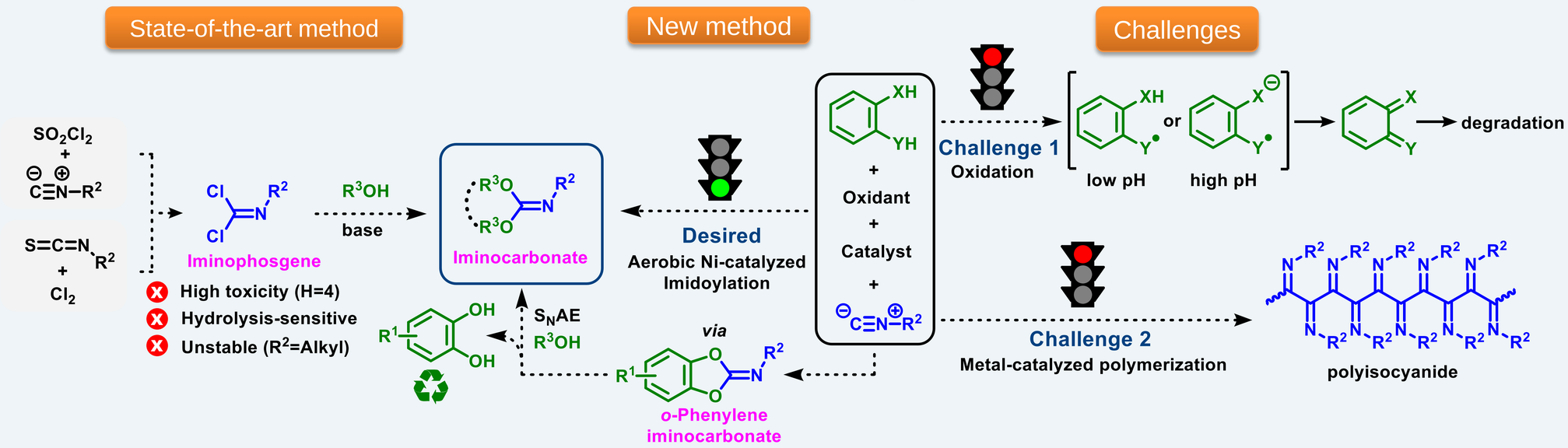
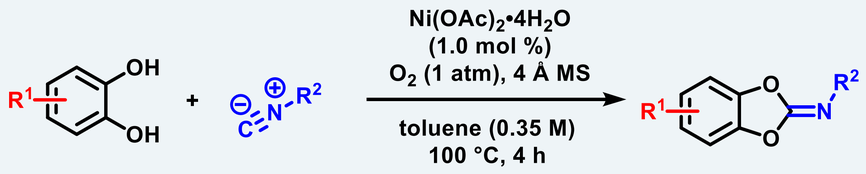
Iminocarbonates and challenges

Iminocarbonates are imino analogues of carbonates, though they are poorly studied C_1 reactants. Suitable routes to synthesize them are missing.[2] We envisaged an aerobic Ni-catalyzed reaction of readily available catechols and isocyanides followed by S_NAE with alcohols. This entails encompassing several challenges.[3,4]



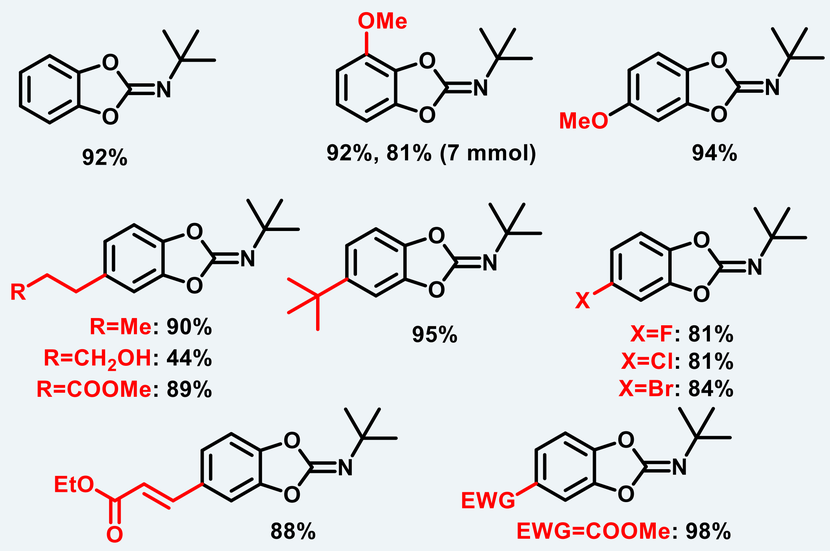
Method and scope

A versatile way to obtain *o*-phenylene *N*-substituted iminocarbonates *via* an aerobic Ni-catalyzed reaction of readily available catechols and isocyanides was developed. 4-Propylcatechol is a particularly interesting catechol as it can be obtained from lignin/wood and provides a renewable leaving group in further transformations (*vide infra*).

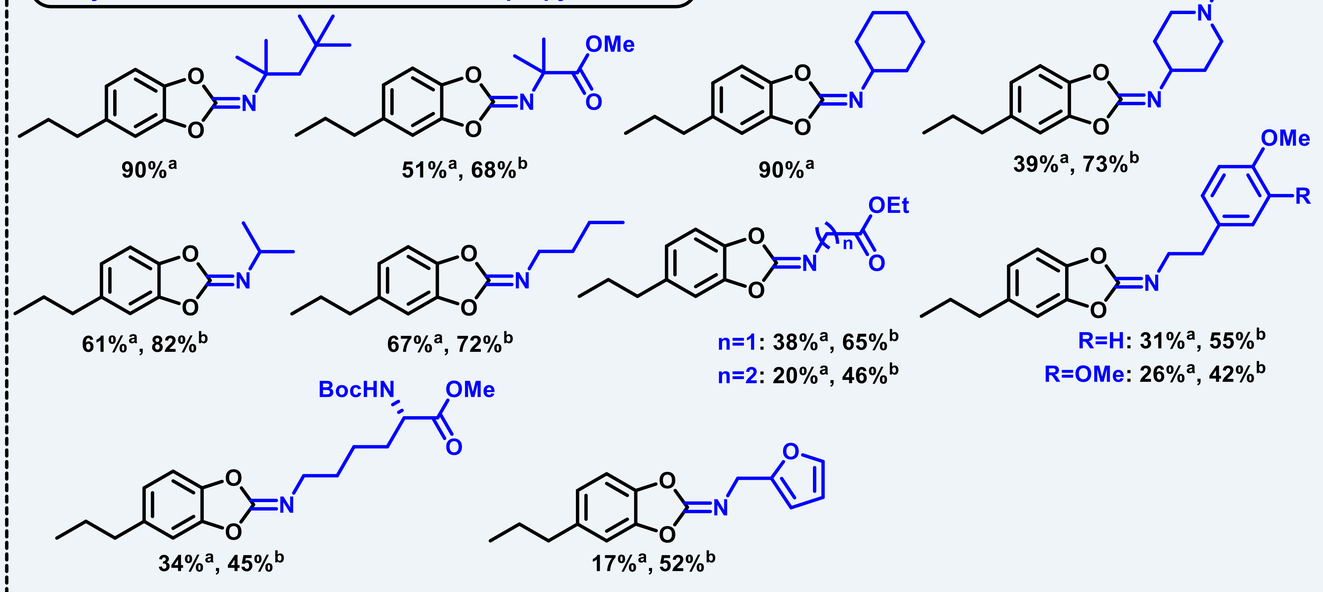


- Large variety of catechols
- Yields 30-98%
- Various alkyl isocyanides
- O_2 as oxidant

Catechol variation with *tert*-butyl isocyanide



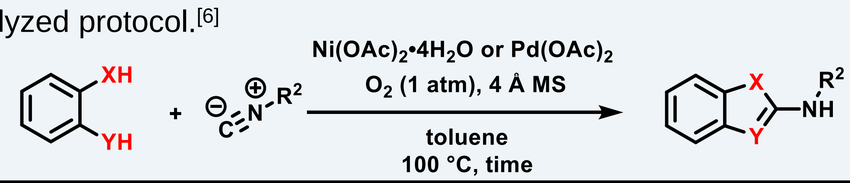
Isocyanide variation with biorenewable 4-propylcatechol[5]

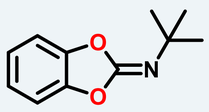
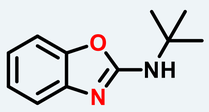
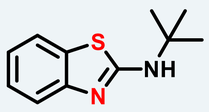
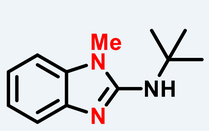


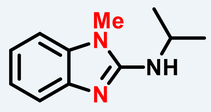
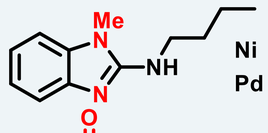
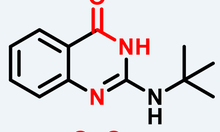
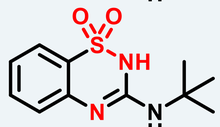
[a]Fast addition, [b]Slow addition

Application on other oxidation-sensitive aromatic 1,2-bis-nucleophiles

The developed protocol can be applied on other readily available and oxidation-sensitive aromatic 1,2-bis-nucleophiles. Overall, the newly developed Ni-catalyzed reaction outperforms our previously reported Pd-catalyzed protocol.[6]



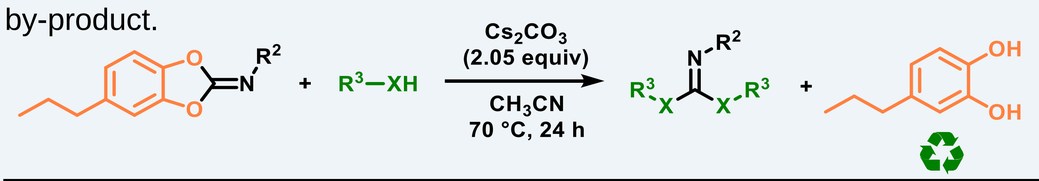
	Cat.	Loading (mol %)	Time (h)	Yield (%)
	Ni	1	2	92
	Pd	5	20	90
	Ni	1	4	90
	Pd	1	22	88
	Ni	1	4	82
	Pd	10	72	69
	Ni	1	2	94
	Pd	1	2	97

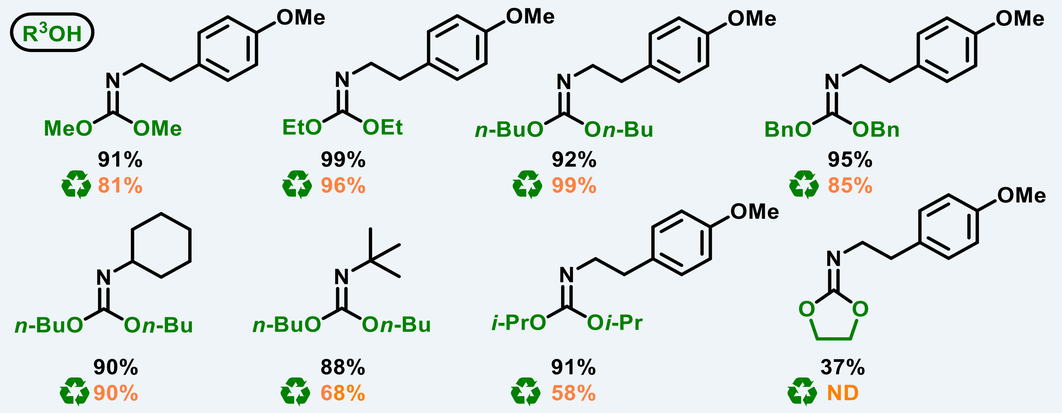
	Cat.	Loading (mol %)	Time (h)	Yield (%)
	Ni	1	4	87
	Pd	1	22	88
	Ni	5	4	90
	Pd	5	20	96
	Ni	1	4	74
	Pd	1	20	79
	Ni	1	4	79
	Pd	10	72	69

- Cheap base metal catalyst
- Similar or improved yields
- Shorter reaction times
- Lower catalyst loading

Application of S_NAE

S_NAE performed on propyl-*o*-phenylene iminocarbonate platform molecules with aliphatic alcohols gives dialkyl *N*-substituted iminocarbonates. Other nucleophiles can be used as well. 4-Propylcatechol is formed as recyclable by-product.





- Unreported S_NAE
- Recoverable 4-propylcatechol
- (Aliphatic) alcohols, thiols, and amines

References

[1] Escudero, J.; Mampuys, P.; Mensch, C.; Bheeter, C. B.; Vroemans, R.; Orru, R. V. A.; Harvey, J.; Maes, B. U. W. *ACS Catal.* **2022**, *12*, 6857-6873. [2] For an example of a route, see: Burdukovskii, V. F.; Mognonov, D. M. *Polym. Sci. Ser. B* **2013**, *55,* 213. [3] Maier, G. P.; Bernt, C. M.; Butler, A. *Biomater. Sci.* **2018**, *6*, 332-339. [4] Schwartz, E.; Koepf, M.; Kitto, H. J.; Nolte, R. J. M.; Rowan, A. E. *Polym. Chem.* **2011**, *2*, 33-47. [5] Bomon, J.; Bal, M.; Achar, T. K.; Sergeyev, S.; Wu, X.; Wambacq, B.; Lemière, F.; Sels, B. F.; Maes, B. U. W. *Green Chem.* **2021**, *23*, 1995-2009. [6] Vlaar, T.; Cioc, R. C.; Mampuys, P.; Maes, B. U. W.; Orru, R. V. A.; Ruijter, E. *Angew. Chem. Int. Ed.* **2012**, *51*, 13058-13061.

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