



# Literature Report

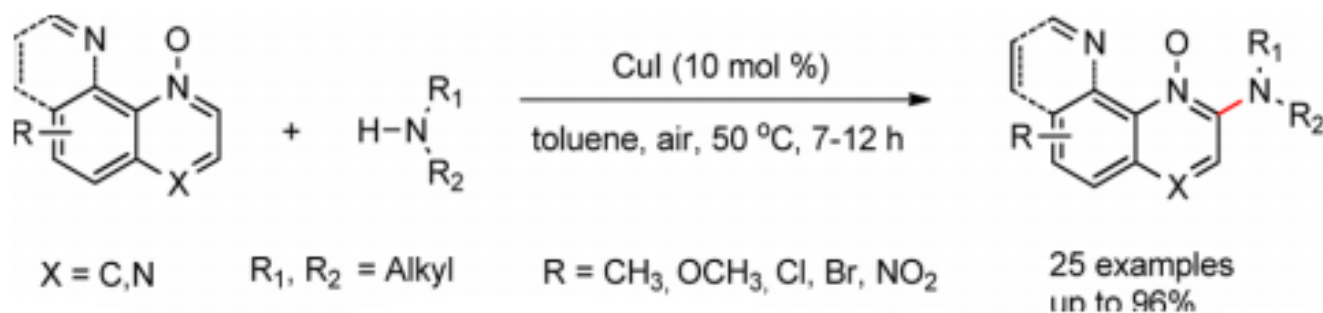
Chao Yang

*Supervisor : Prof. Jing Zhao*  
*Dr. Mei Hong*

2014-09-02

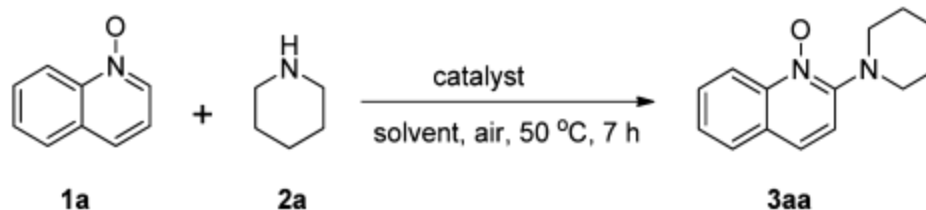
# Copper-Catalyzed Direct Amination of Quinoline N-Oxides via C–H Bond Activation under Mild Conditions

Chongwei Zhu, Meiling Yi, Donghui Wei, Xuan Chen, Yangjie Wu\*, and Xiuling Cui\*





# Optimizing Reaction Parameters for the Condensation of Quinoline N-Oxide 1a with Piperidine 2a



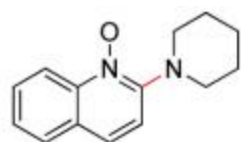
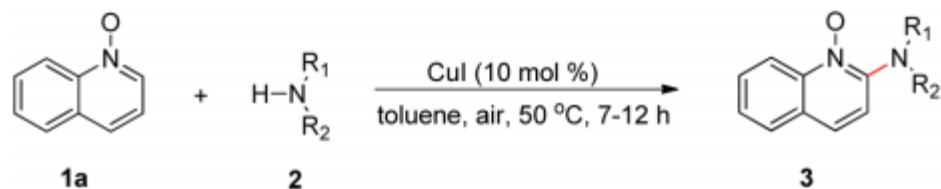
entry	catalyst (equiv)	solvent	amine (equiv)	yield <sup>b</sup> (%)	entry	catalyst (equiv)	solvent	amine (equiv)	yield <sup>b</sup> (%)
1	Cu(OAc) <sub>2</sub> (0.2)	toluene	8.0	85	13	CuI (0.2)	DCE	8.0	NR
2	Cu(OTf) <sub>2</sub> (0.2)	toluene	8.0	84	14	CuI (0.2)	DMF	8.0	trace
3	CuBr <sub>2</sub> (0.2)	toluene	8.0	83	15	CuI (0.2)	toluene	7.0	85
4	CuBr (0.2)	toluene	8.0	80	16	CuI (0.2)	toluene	6.0	82
5	CuCl (0.2)	toluene	8.0	89	17	CuI (0.2)	toluene	4.0	75
6	CuI (0.2)	toluene	8.0	94	18	CuI (0.1)	toluene	8.0	91
7	NiCl <sub>2</sub> ·6H <sub>2</sub> O (0.2)	toluene	8.0	NR	19	CuI (0.08)	toluene	8.0	86
8	Pd(OAc) <sub>2</sub> (0.2)	toluene	8.0	NR	20	CuI (0.05)	toluene	8.0	78
9	CoCl <sub>2</sub> (0.2)	toluene	8.0	NR	21	CuI (0.1)	toluene	8.0	86 <sup>c</sup>
10	CuI (0.2)	THF	8.0	80	22	CuI (0.1)	toluene	8.0	70 <sup>d</sup>
11	CuI (0.2)	CH <sub>3</sub> CN	8.0	78					
12	CuI (0.2)	DMSO	8.0	NR					

<sup>a</sup>Reaction conditions: 1a (0.2 mmol), solvent (1.5 mL), 50 °C, 7 h.  
<sup>b</sup>Isolated yield based on 1a. <sup>c</sup>40 °C. <sup>d</sup>30 °C. NR = no reaction.

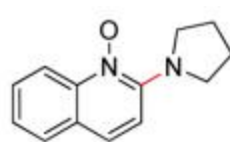
CuI (10 mol %), amine (8.0 equiv), toluene, 50° C, under air



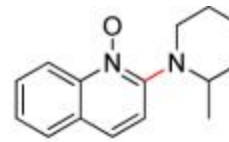
# Copper-Catalyzed Amination of Quinoline N-Oxide with Various Amines



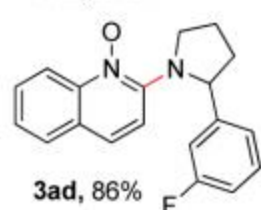
**3aa**, 91%



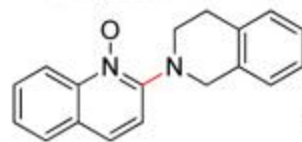
**3ab**, 86%<sup>b</sup>



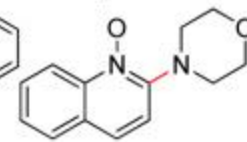
**3ac**, 45%<sup>d</sup>



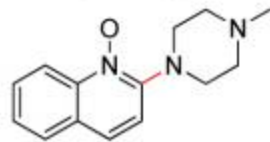
**3ad**, 86%



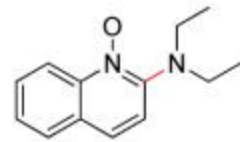
**3ae**, 88%<sup>c</sup>



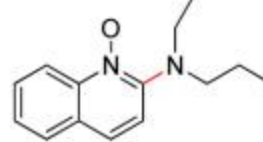
**3af**, 93%<sup>c</sup>



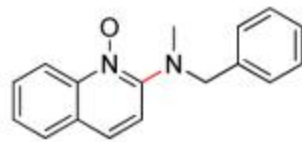
**3ag**, 44%<sup>b</sup>



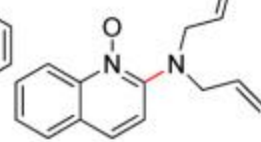
**3ah**, 91%<sup>c</sup>



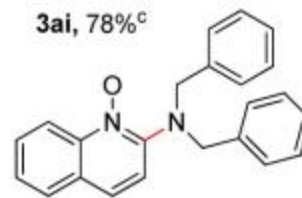
**3ai**, 78%<sup>c</sup>



**3aj**, 90%<sup>c</sup>



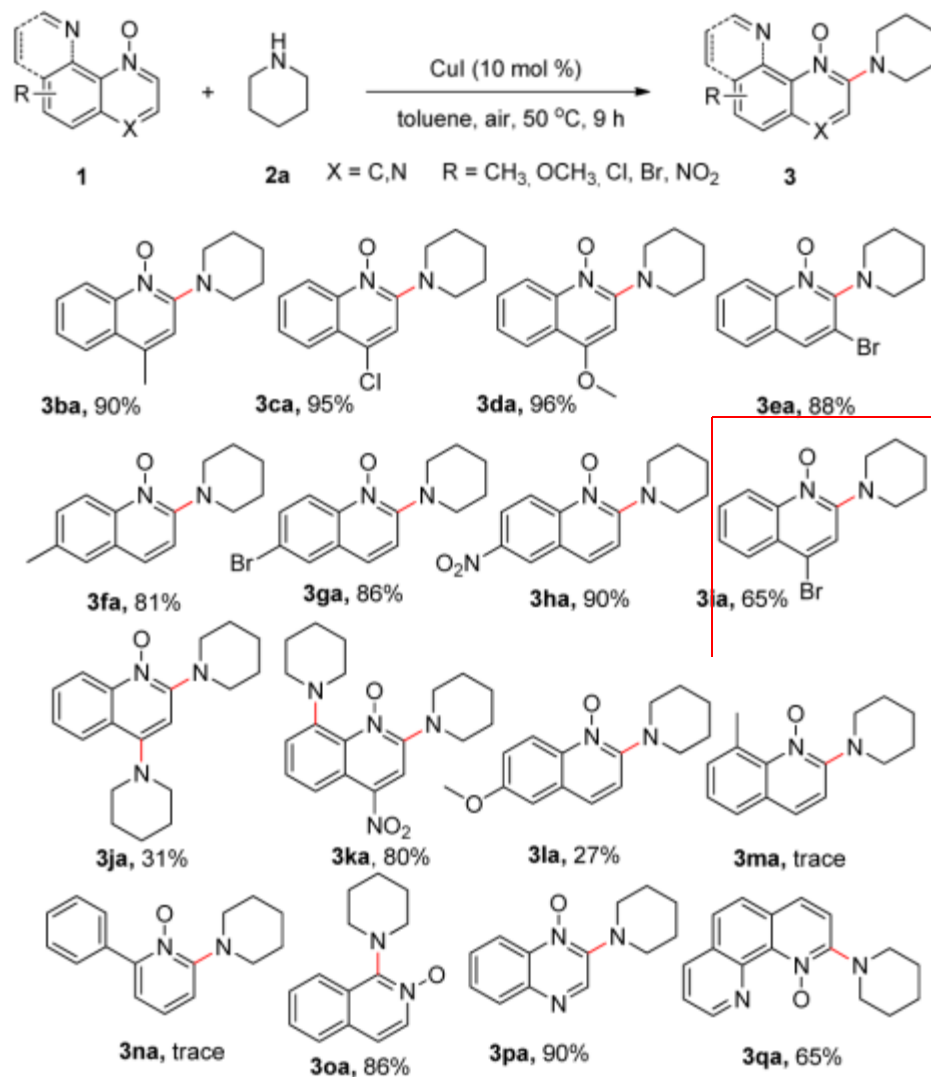
**3ak**, 27%<sup>c</sup>



**3al**, 25%<sup>c</sup>

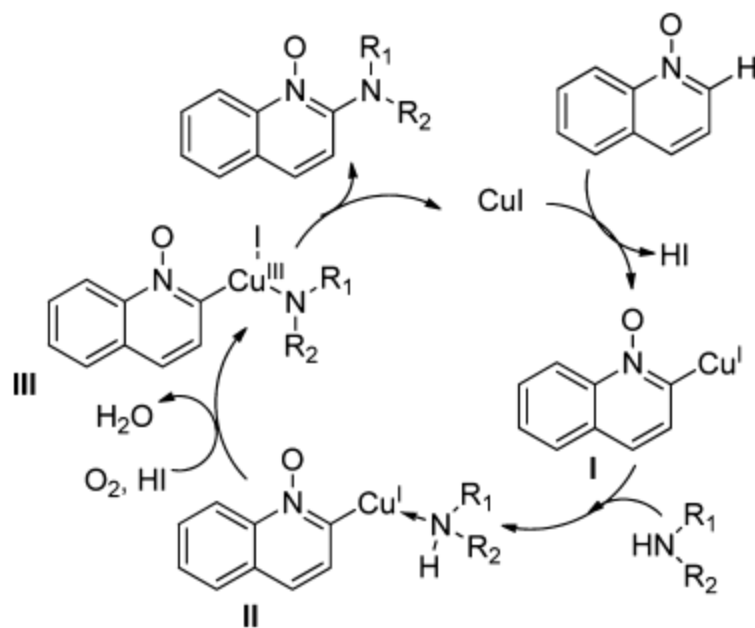
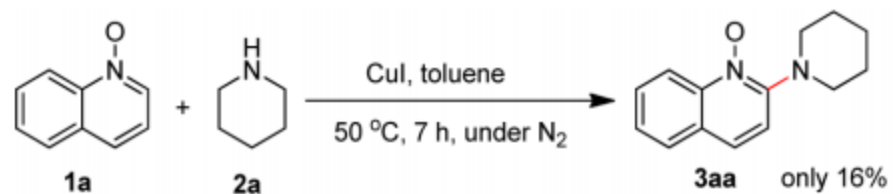


# Copper-Catalyzed Amination of Quinoline N-Oxides with Piperidine





# Plausible Reaction Mechanism





## Conclusion

### Copper-Catalyzed Direct Amination of Quinoline N-Oxides via C–H Bond Activation

#### Advantages:

- simple system, high efficiency, atomic economy, environmental friendliness
- low reaction temperature, and ligand, additives, base, and external oxidant free conditions
- the feasibility of the mechanism was also verified by density functional theory (DFT)

#### Disadvantages:

Mechanism, substrates, application, selectivity



**Thank you!**