

Sustainable *N*-Formylation of Primary Sulfonamides Using Carbon Dioxide as Carbon Source

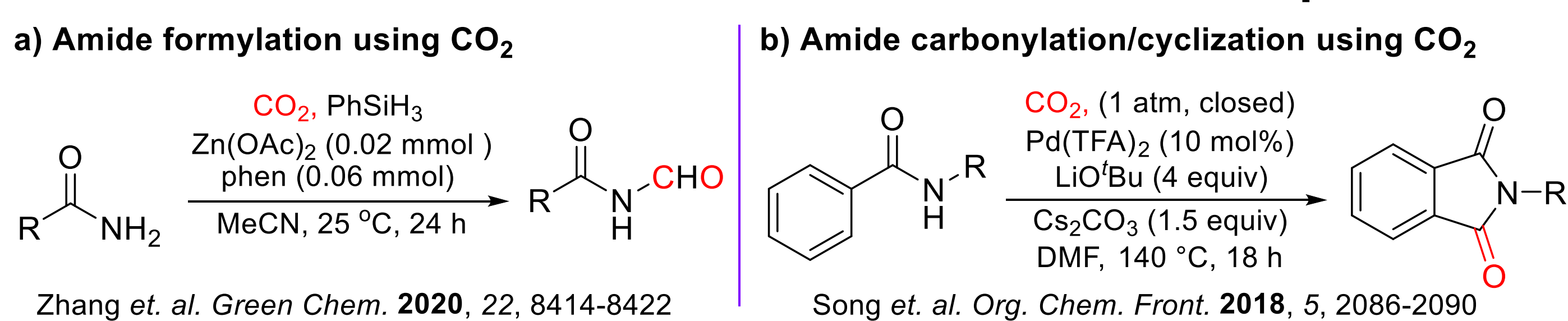
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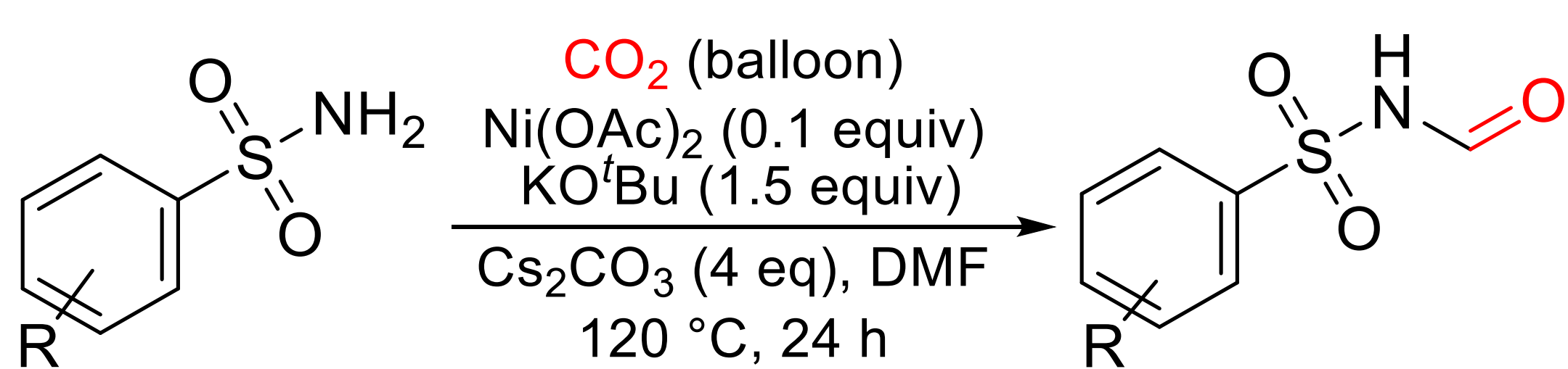
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Background

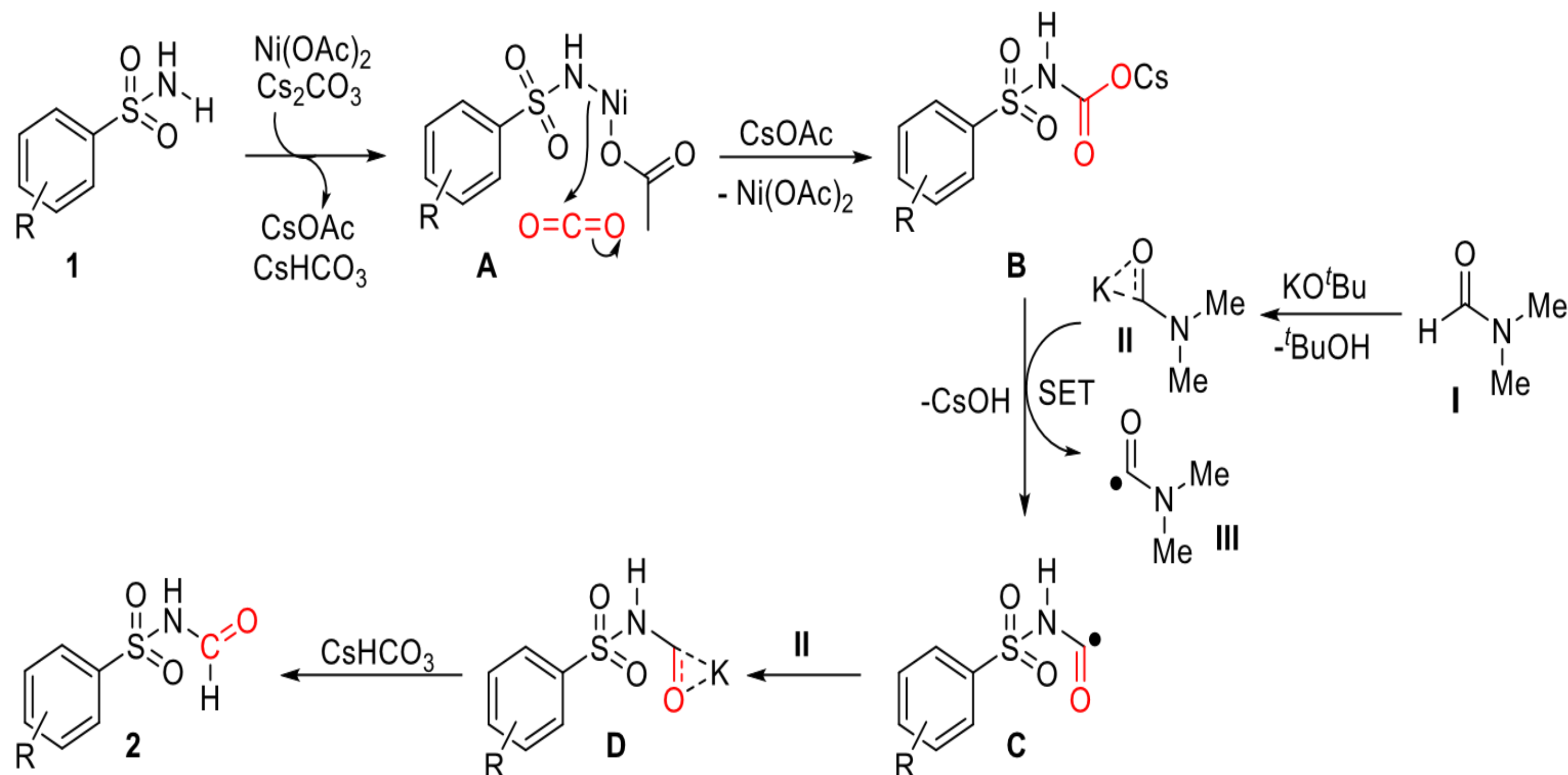
Carbon dioxide is the most significant greenhouse gas, and its increasing amount in the atmosphere has propelled research efforts aimed at its sequestration and conversion to other value-added compounds.



Our work



Mechanism of *N*-formylation



Optimization of solvent

Entry	Catalyst/solvent	Yield (%)
1	Pd(OAc) ₂ , DMF	83
2	Pd(OAc) ₂ , DMA	74
3	Pd(OAc) ₂ , DMSO	61
4	Ni(OAc) ₂ , DMF	88
5	Ni(OAc) ₂ , DMA	78
6	Ni(OAc) ₂ , DMSO	ND

Optimization of carbonate

Entry	Carbonate	Yield (%)
1	Cs ₂ CO ₃	87.66
2	K ₂ CO ₃	85.45
3	Na ₂ CO ₃	83.82
4	No CO ₃ ²⁻	11.0

Acknowledgements

Chandrakanta Kesavan Centre for Energy Policy and Climate Solutions

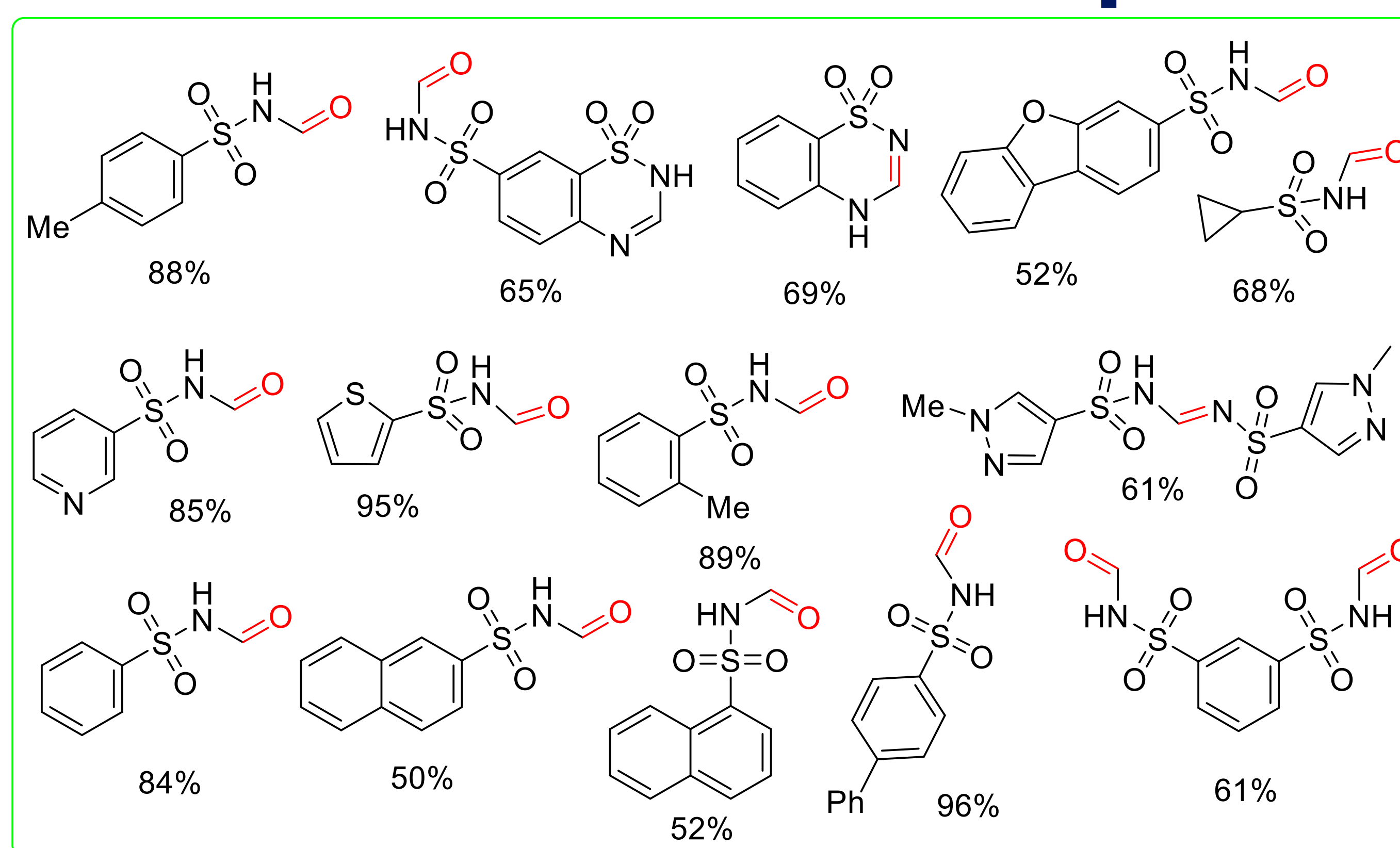
Optimization of catalyst

Entry	Catalyst	Yield (%)
1	Pd(OAc) ₂	83
2	Ni(OAc) ₂	88
3	Cu(OAc) ₂	41

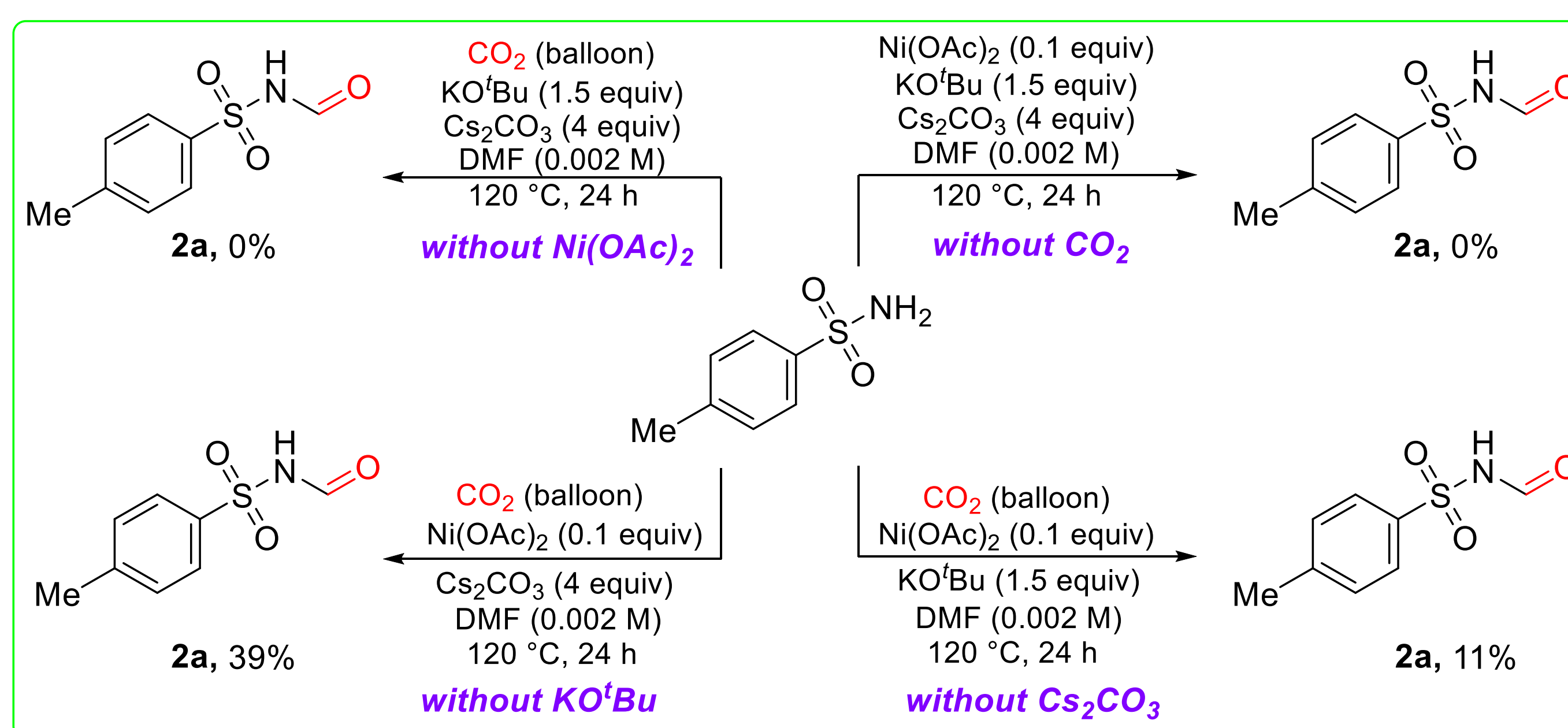
Optimization of butoxide

Entry	Base/CO ₂	Yield (%)
1	K ^t OBu	88
2	Na ^t OBu	57
3	No butoxide	39
4	K ^t OBu, No CO ₂	ND

Some substrate scope



Control experiment



Conclusion

The selective *N*-formylation of primary sulfonamide using carbon dioxide as a formyl equivalent has been developed. The wide scope, mild conditions, and the ability to incorporate CO₂ as a formyl under ambient pressure are the highlights of this method

Deuterated experiment

