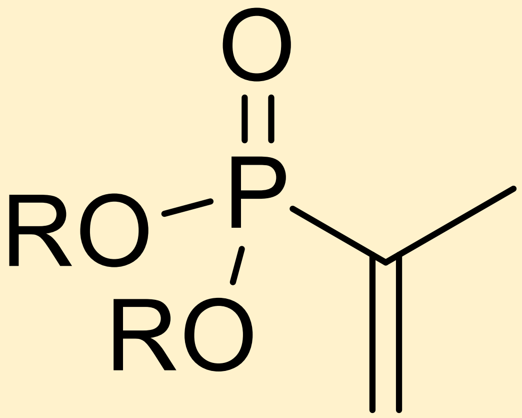
TCU Chemistry & Biochemistry Department
Montchamp Research Group
Emily Sherman



Synthesis of Alkenylphosphorus Compounds

Efficient, Scalable, & Applicable

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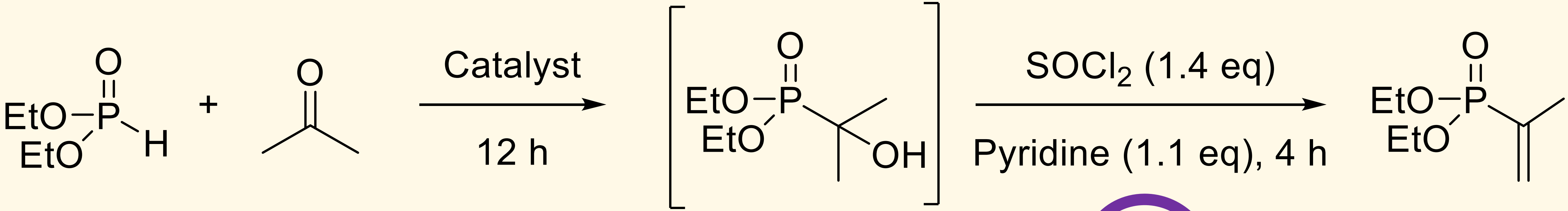
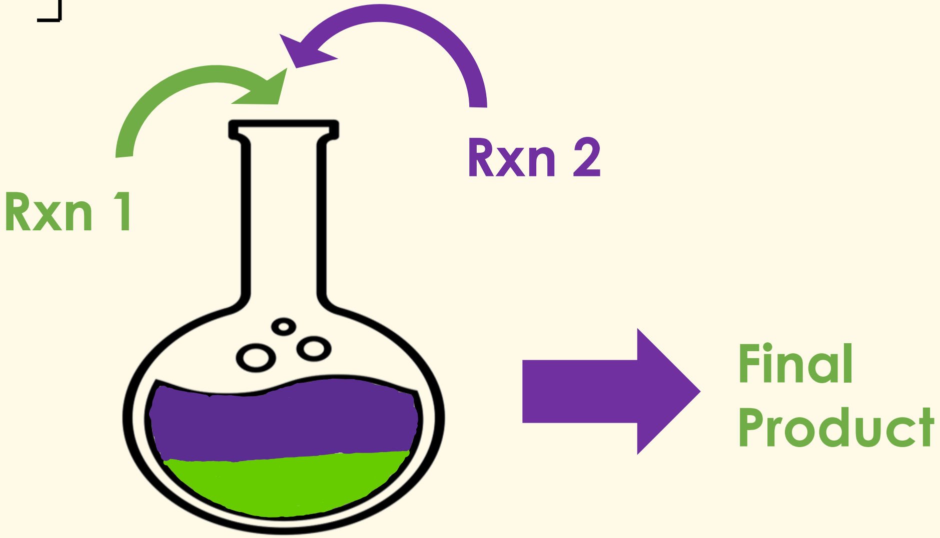


Acid vs. base catalyst

One-pot process

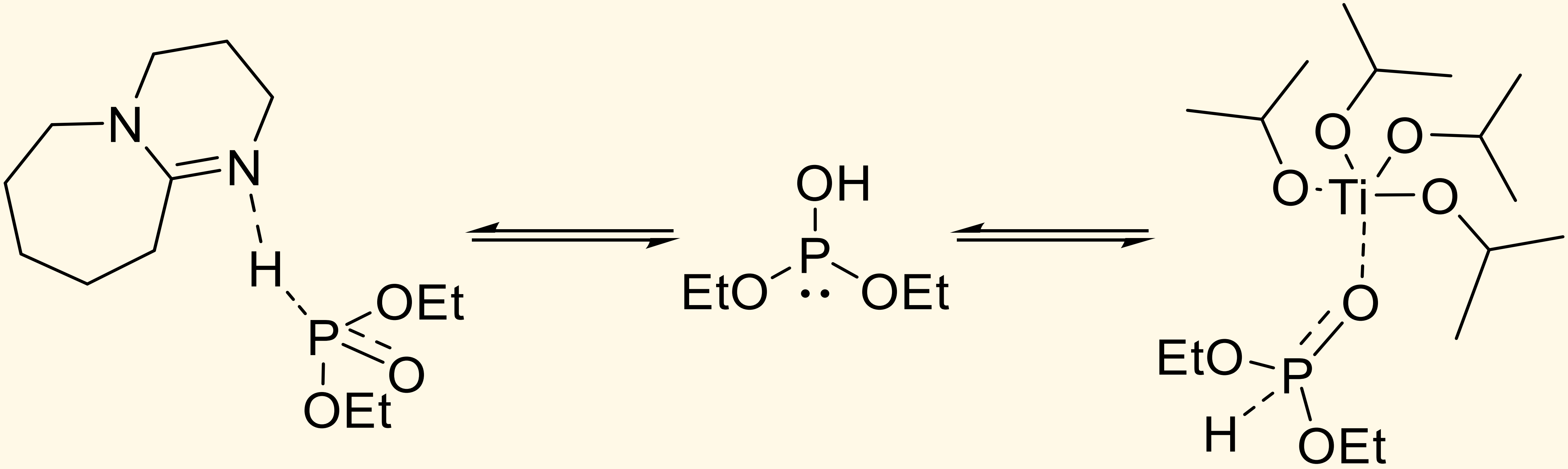
Exploring scope



Why Use a Catalyst?

Lewis Base: DBU

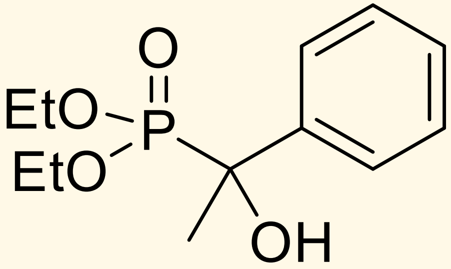
Lewis Acid: $Ti(O\text{-}i\text{-}Pr)_4$



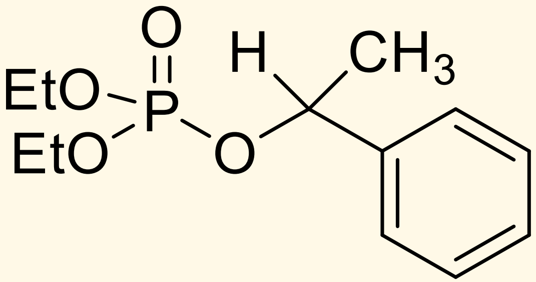
Results: Base vs. Acid Catalyst

Substrate	DBU Addition Yield
Acetone	89
Acetophenone	**Rearrangement**
Cyclopentanone	83
Cyclohexanone	98

Table 1: Addition step yields by ^{31}P NMR



Expected



Obtained

Results: Acid vs. Base Catalyst

Ketone	DBU Total yield, One-pot	$Ti(O\text{-}i\text{-}Pr)_4$ Total Yield, One-pot
Acetone	61	**83**
Cyclohexanone	12	24
Cyclopentanone	22	--
Acetophenone	Rearrangement	**58**

Table 2: One-pot total yields by ^{31}P NMR

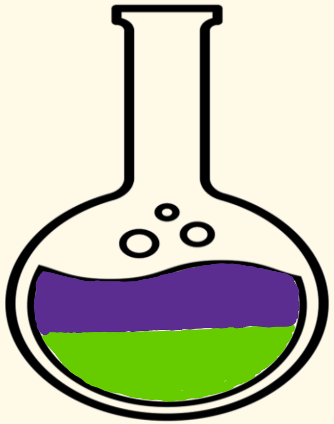
Acid catalyst more efficient & versatile

Results: One-pot Synthesis

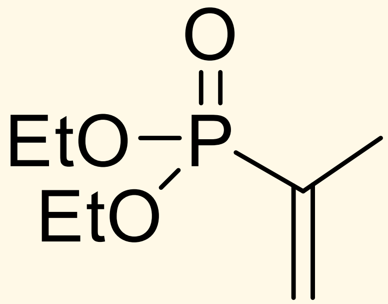
Ketone (Catalyst)	One-Pot	Two-Step w/ Work-Up
Acetone (DBU)	61	80
Acetone ($Ti(O\text{-}i\text{-}Pr)_4$)	83	---
Acetophenone ($Ti(O\text{-}i\text{-}Pr)_4$)	58	47

Table 3: ^{31}P NMR Total Yields for one-pot and two-step methods for selected substrates

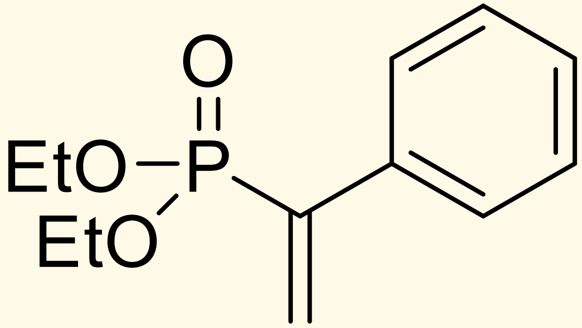
Comparable yields with one-pot



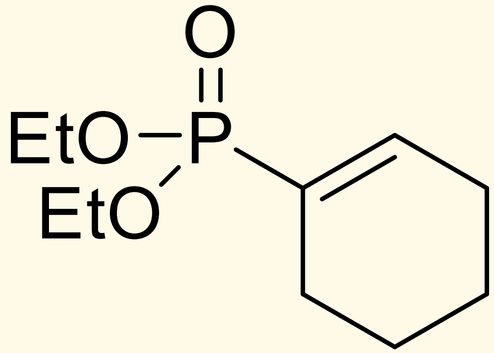
Results: Exploring the Scope



83%



58%



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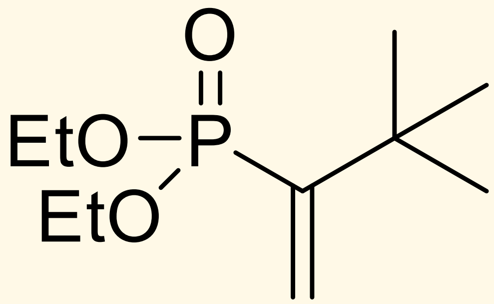

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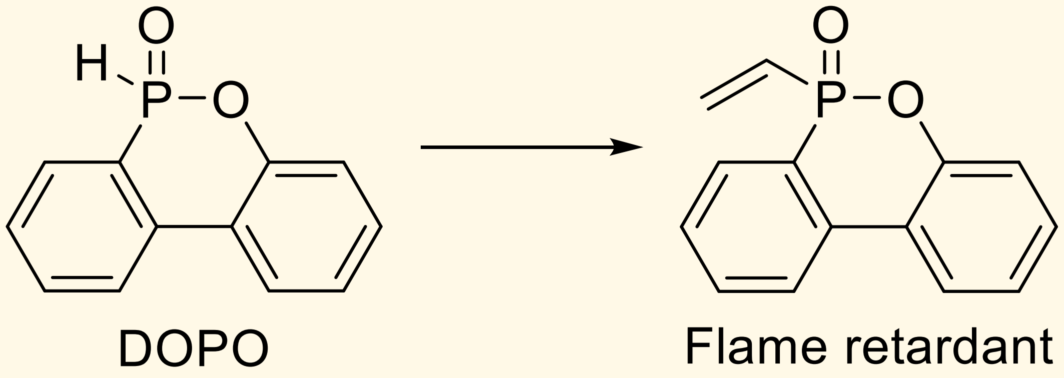
Percent yields with $Ti(O\text{-}i\text{-}Pr)_4$ and one-pot method

What's Next

- Expanding scope
- Isolated yields
- Industrial Applications



Nakamura, S.; Tatsumi, S.; Miyamoto, R. Japan Patent JP 2015004010 A 20150108. EPA project: Flame Retardants in printed circuit boards partnership https://www.flameretardants-online.com/news/archive?showid=17846.

Acknowledgements

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Questions?