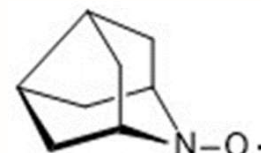


Alcohol  
Oxidation

# nor-AZADO

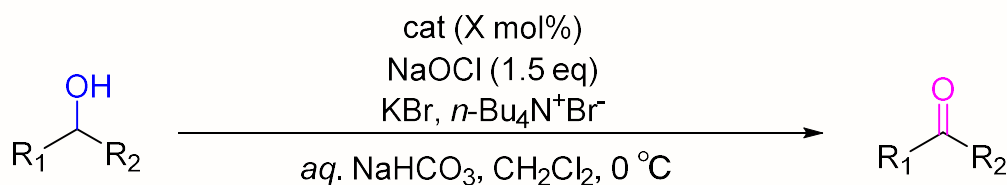
## Features

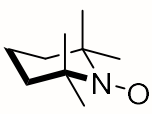
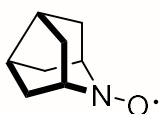
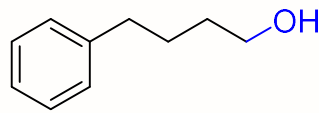
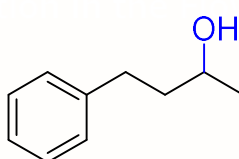
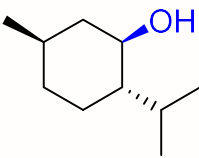
- ◆ Ultra-high activity alcohol oxidation catalyst
- ◆ Applicable to various substrates
- ◆ Possible to oxidize secondary alcohols with large steric hindrance
- ◆ Air oxidation of alcohol is possible
- ◆ Bulk supply available



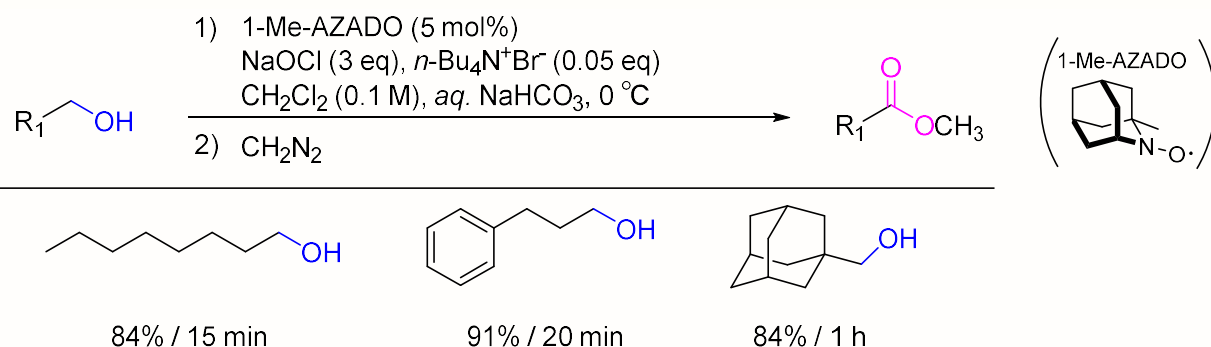
## Reaction Example

■ Oxidation of primary and secondary alcohols under very small amount of catalyst

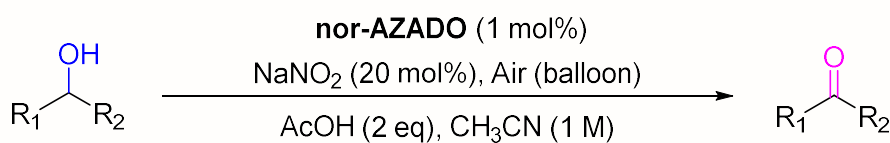


Substrate	Loading amount (X mol%)	time (min)	 (TEMPO)	 (nor-AZADO)
	1	20	89	92
	0.01	20	19	89
	0.003	30	-	82
	1	20	97	99
	0.01	30	28	99
	0.005	30	-	96
	0.003	40	-	92
	1	20	5	99
	0.01	20	-	98
	0.005	30	-	96
	0.003	40	-	92

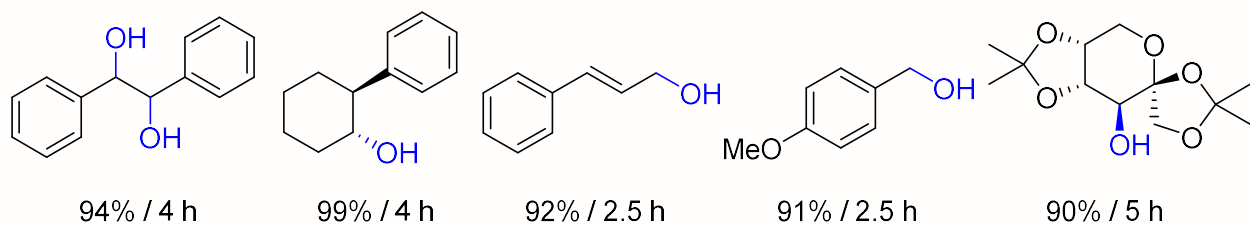
■ Oxidation of primary alcohols to carboxylic acids



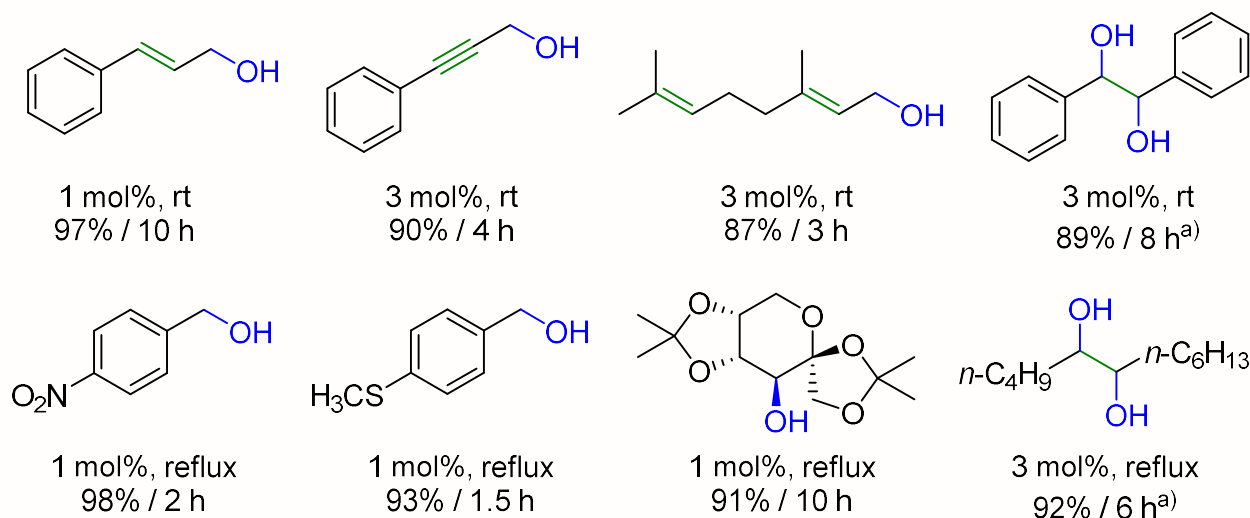
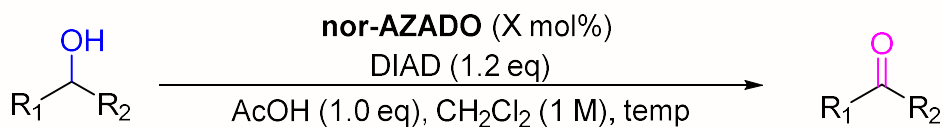
■ Air oxidation of alcohols with NO<sub>x</sub> as co-oxidant



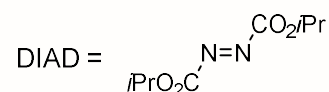
Alcohol



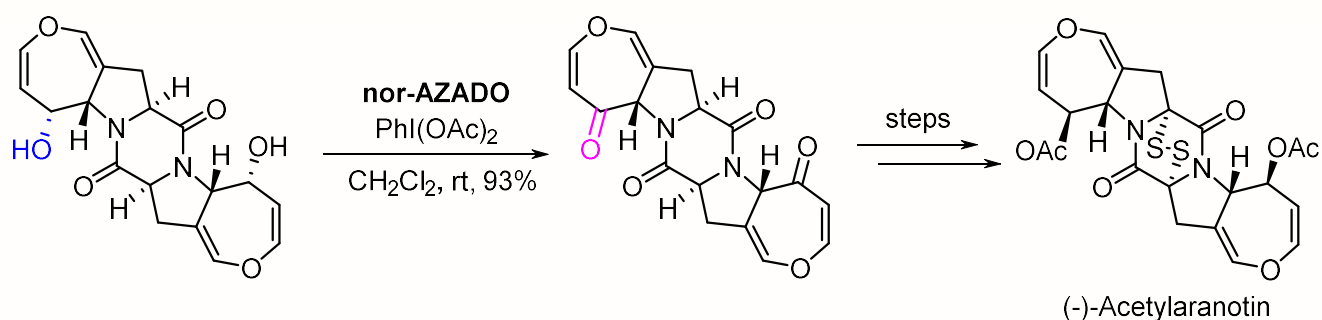
■ Oxidation of alcohols with Mitsunobu reagent DIAD as co-oxidant



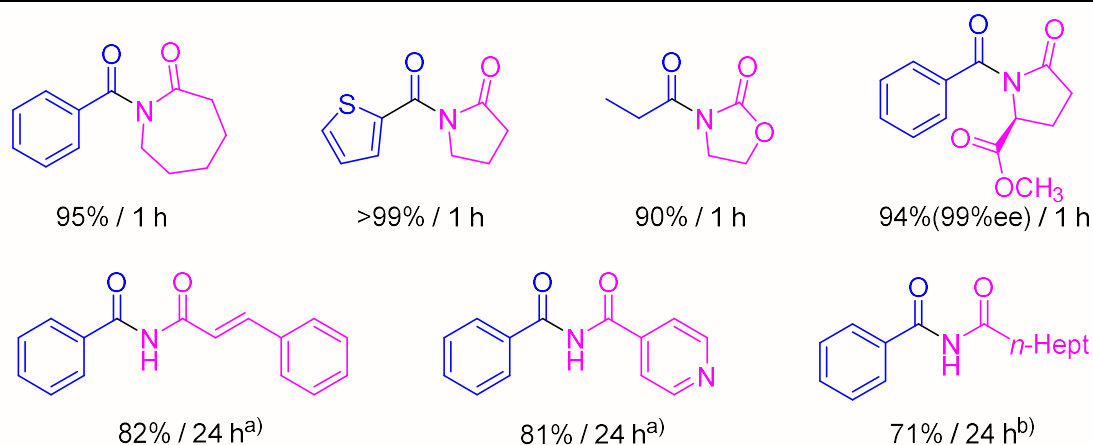
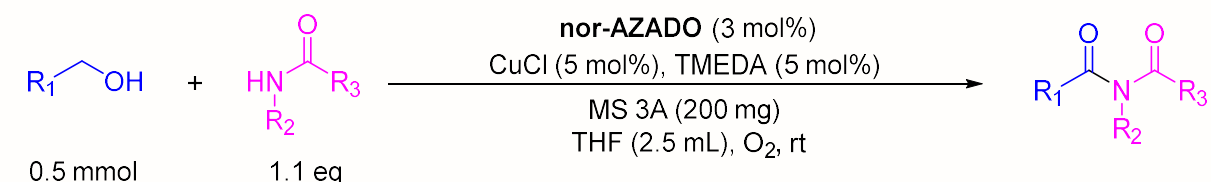
a) 2 eq of DIAD



## Application to natural product synthesis



## Acylation of amide compounds with alcohols



a) *t*BuOK (1 eq) was used. b) *t*BuOK (0.5 eq) was used.

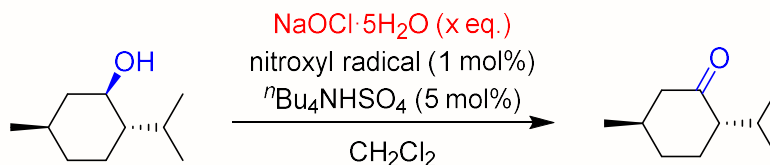
## <References>

- Iwabuchi, Y. *et al.* : *Chem. Pharm. Bull.*, **59**, 1570 (2011).  
 Iwabuchi, Y. *et al.* : *Chem. Pharm. Bull.*, **61**, 1197 (2013).  
 Iwabuchi, Y. *et al.* : *Organic Square*, **45**, 2 (2013).  
 Iwabuchi, Y. *et al.* : *Chem. Asian J.*, **10**, 1004 (2015).  
 Iwabuchi, Y. *et al.* : *Chem. Sci.*, **9**, 4756 (2018).

Code No.	Product Name	Package Size
012-24981	nor-AZADO <span style="float: right;">Ref</span>	100mg
016-24984		1g
012-24986		5g
010-24982		100g
197-02206	Sodium Hypochlorite Solution [NaOCl]	500ml
040-27682	Diisopropyl Azodicarboxylate [DIAD] <span style="float: right;">Ref</span>	25ml
042-27681		100ml
049-32961	(Diacetoxyiodo)benzene [PhI(OAc) <sub>2</sub> ]	5g
047-32962		25g

## NaOCl·5H<sub>2</sub>O

- Stable compared to solutions
- Can be used at high concentration (effective chlorine 39.0% or more)



nitroxyl radicals	NaOCl·5H <sub>2</sub> O (x eq.)	Temp. (°C)	Time (h)	Yield (%)
TEMPO	1.6	15	2	96
1-Me-AZADO	1.4	rt	0.5	98

<Reference>

•Okada, T., Asawa, T., Sugiyama, Y., Kirihara, M., Iwai, T. and Kimura, Y.: *Synlett.*, **25**, 596 (2014).

Code No.	Product Name	Package Size
195-17212	Sodium Hypochlorite Pentahydrate	25g
199-17215		500g

## TEMPO

- The most common nitroxyl radical
- Our TEMPO is not a lump but a fine crystal



Code No.	Product Name	Package Size
209-19501	2,2,6,6-Tetramethyl-1-piperidinyloxy, Radical [TEMPO]	5g
207-19502		25g
205-19503		100g

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