

OC2

KING'S
College
LONDON

Synthesis

–

Reactivity of Alcohols

Dr. Michael J. Bojdys

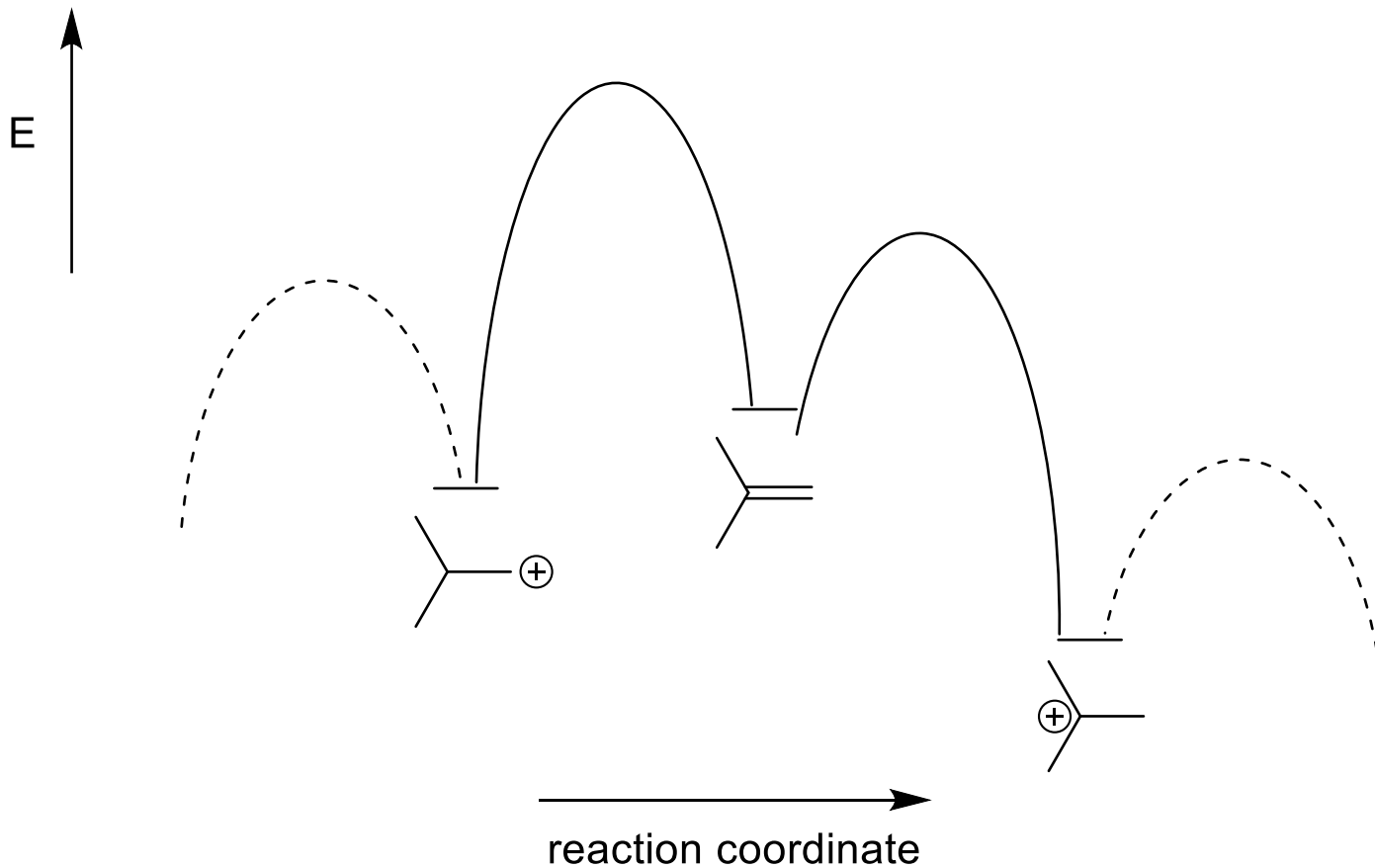
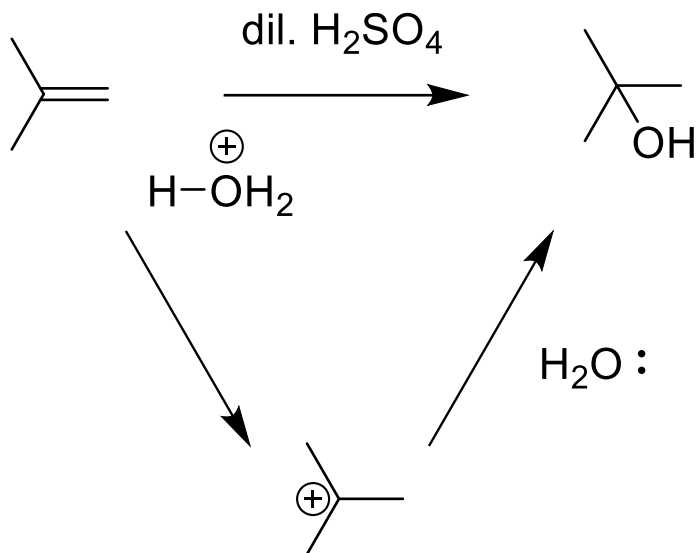
michael.bojdys@kcl.ac.uk

<http://bojdyslab.org>

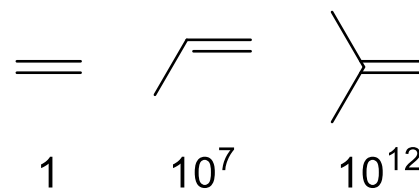
@mjbojdys

Hydration and Hydroboration

Acid-catalysed hydration:

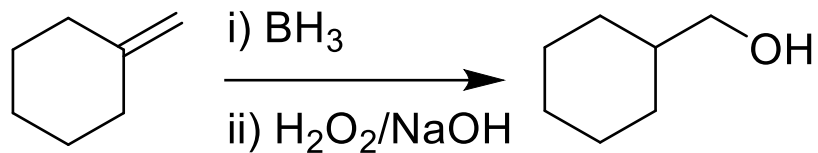


Relative rates (reflect T.S. stabilisation)



Hydration and Hydroboration

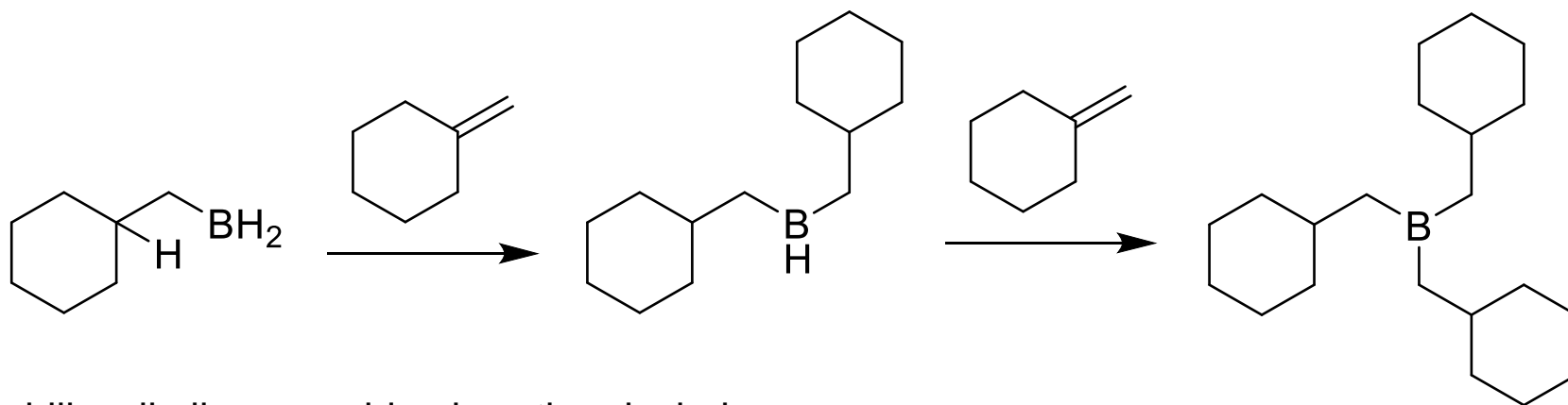
Hydroboration can reverse the *regiochemistry* of hydration:



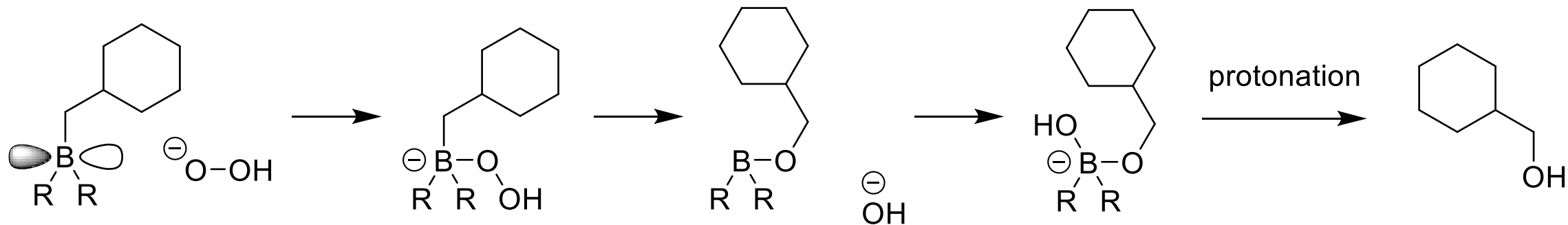
Mechanism:



Can happen again (and again!)

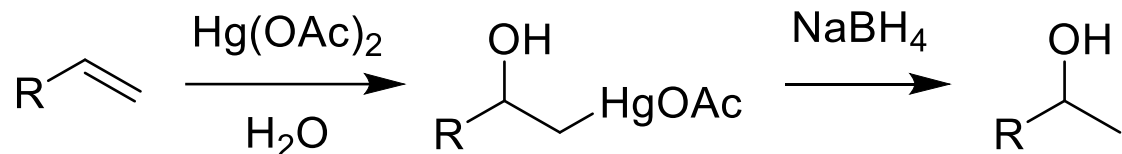


Oxidation with nucleophilic, alkaline peroxide gives the alcohol:

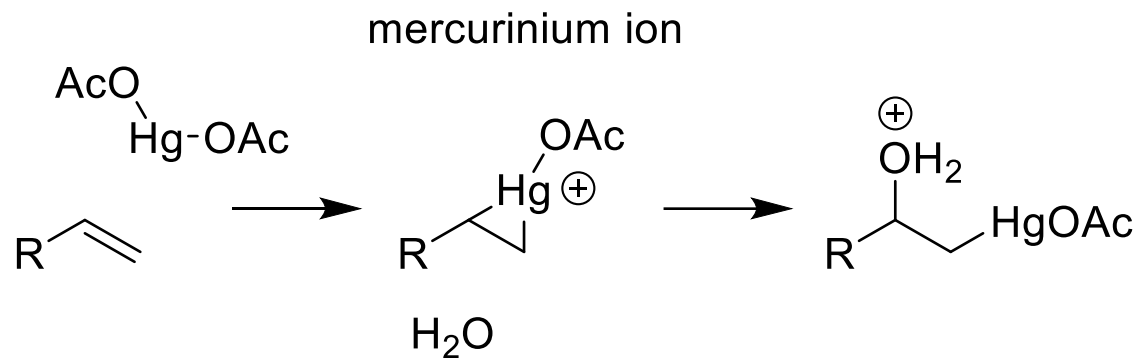


Hydration of Alkenes using Metal Salts

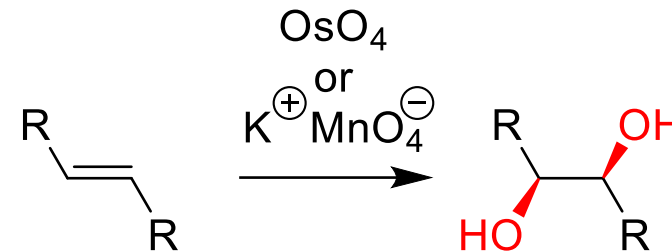
Oxymercuration (using Mercury(II) acetate):



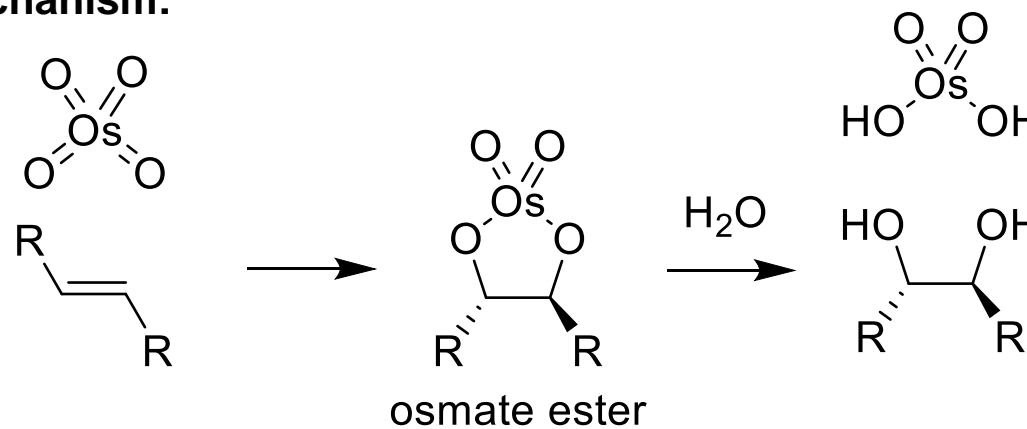
Mechanism:



Dihydroxylation (adds **two OH-groups syn** to a double bond):

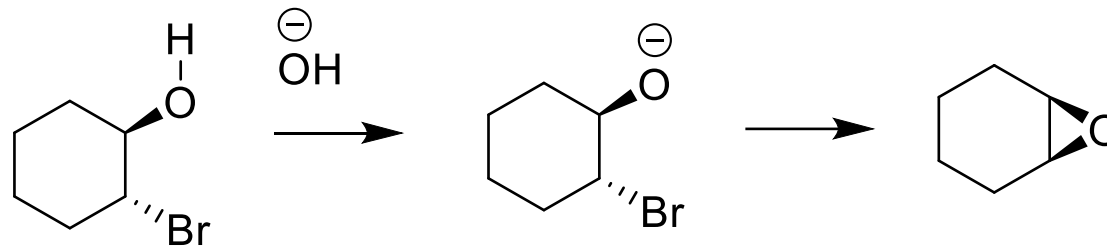


Mechanism:

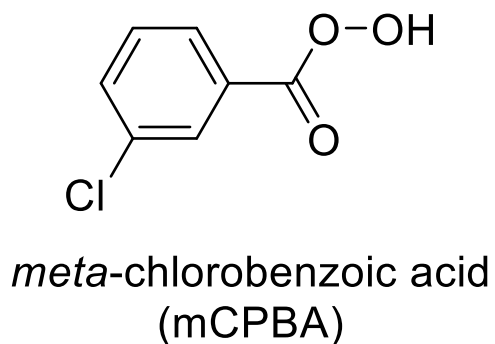


Epoxidation and Epoxide Chemistry

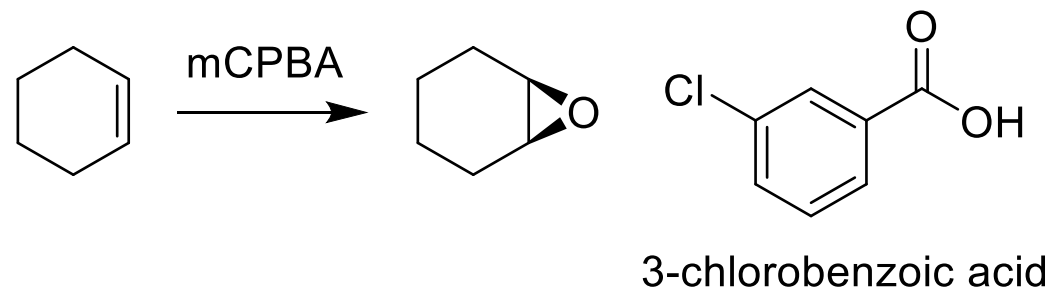
Epoxide formation:



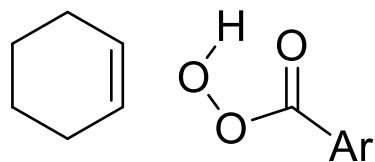
Direct epoxidation using a peracid, RCO_3H :



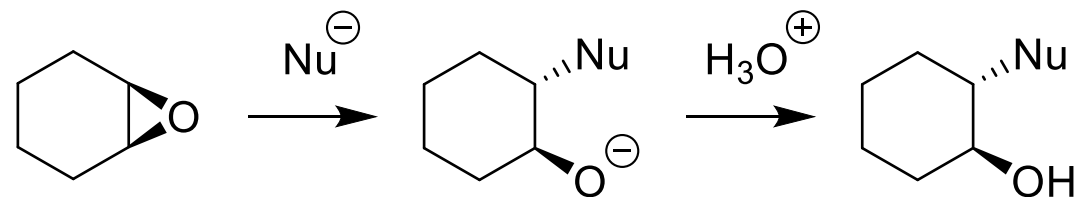
One-step oxidation:



Mechanism:



Epoxide reactivity



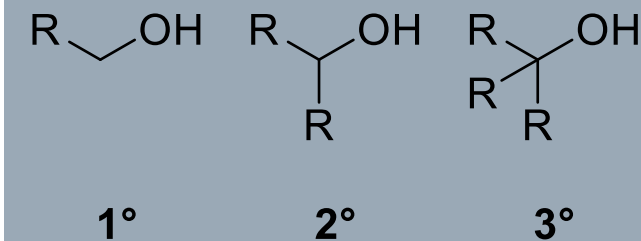
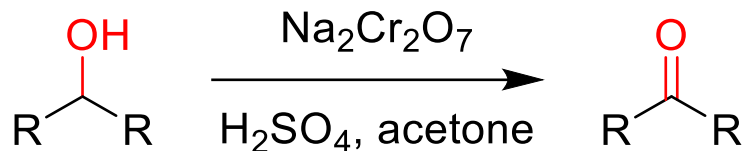
e.g. for $\text{Nu}^- = \text{OH}^-, \text{RNH}_2^-, \text{OR}^-$

(can add **two OH-groups anti** to a double bond)

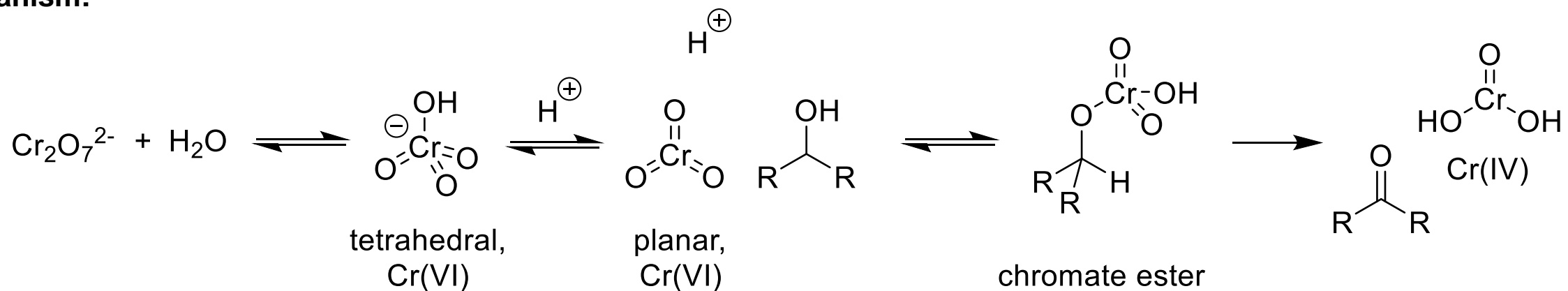
Oxidation of Alcohols

Jones oxidation – using sodium dichromate in sulfuric acid

Oxidation of 2° alcohols yields ketones

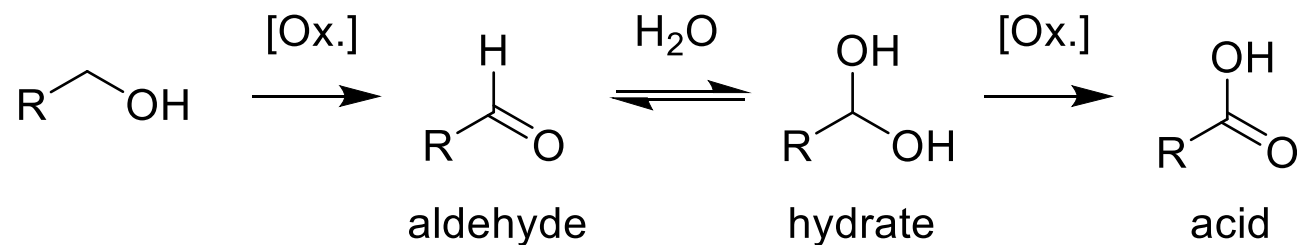


Mechanism:

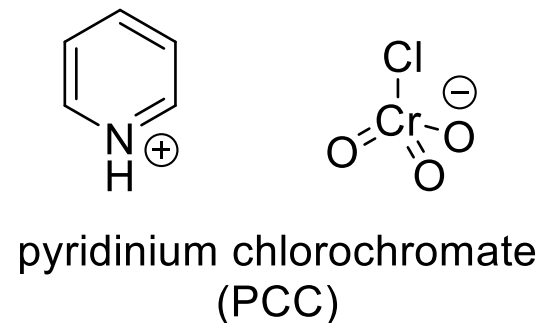


Oxidation of 1° alcohols

Problem: overoxidation of aldehydes in the presence of water



Solution: avoid water!

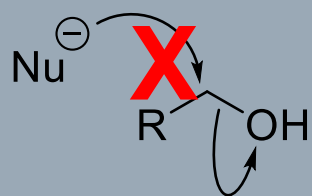


or Dess-Martin,
Swern-Ox.

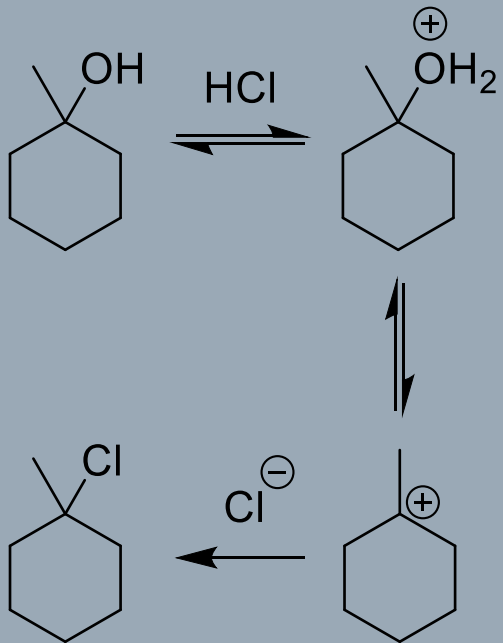
Eliminations and Substitutions

Revision reminder:

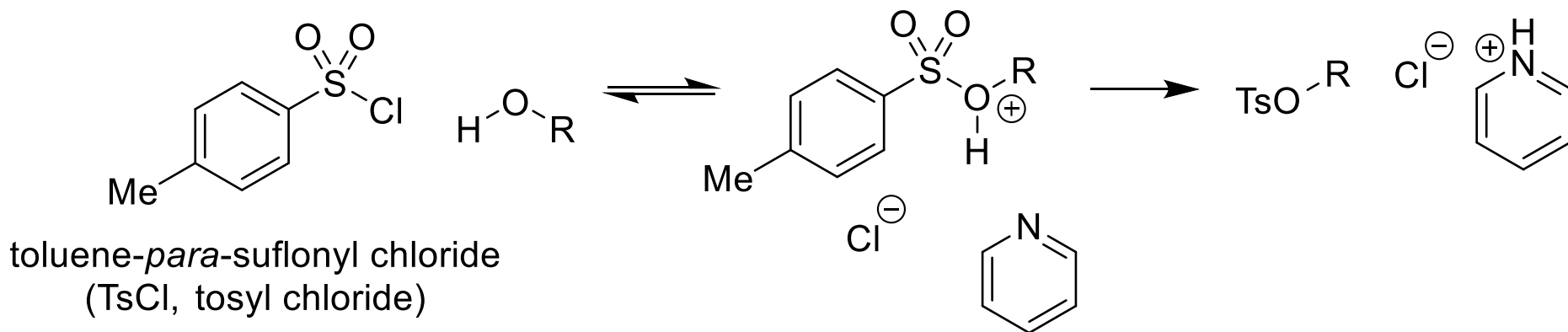
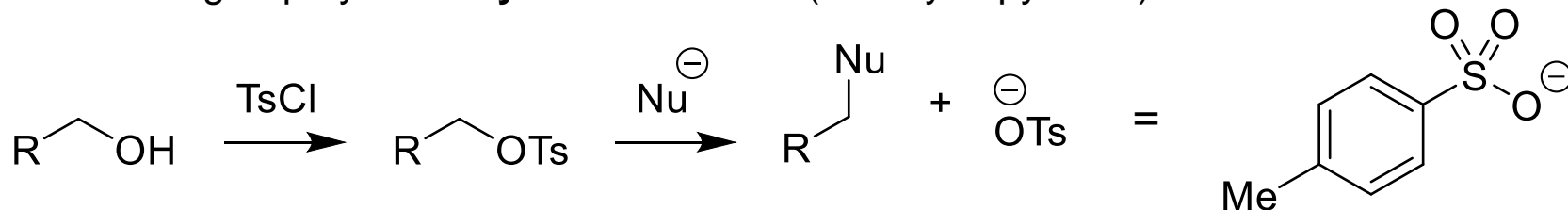
Alcohols never react directly with nucleophiles



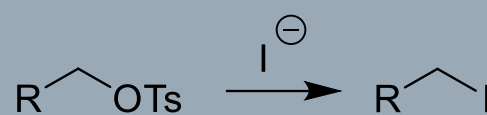
Need to activate -OH somehow, e.g. by protonation:



Activation of -OH group by the **tosylation reaction** (usually in pyridine)



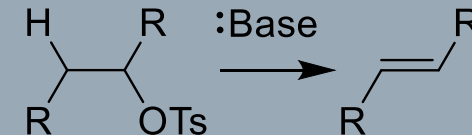
Substitutions (e.g. alkyl iodide)



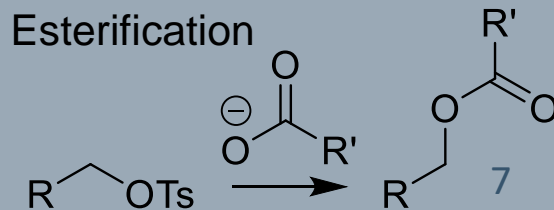
Reductions (e.g. alkane)



Eliminations (e.g. alkene)



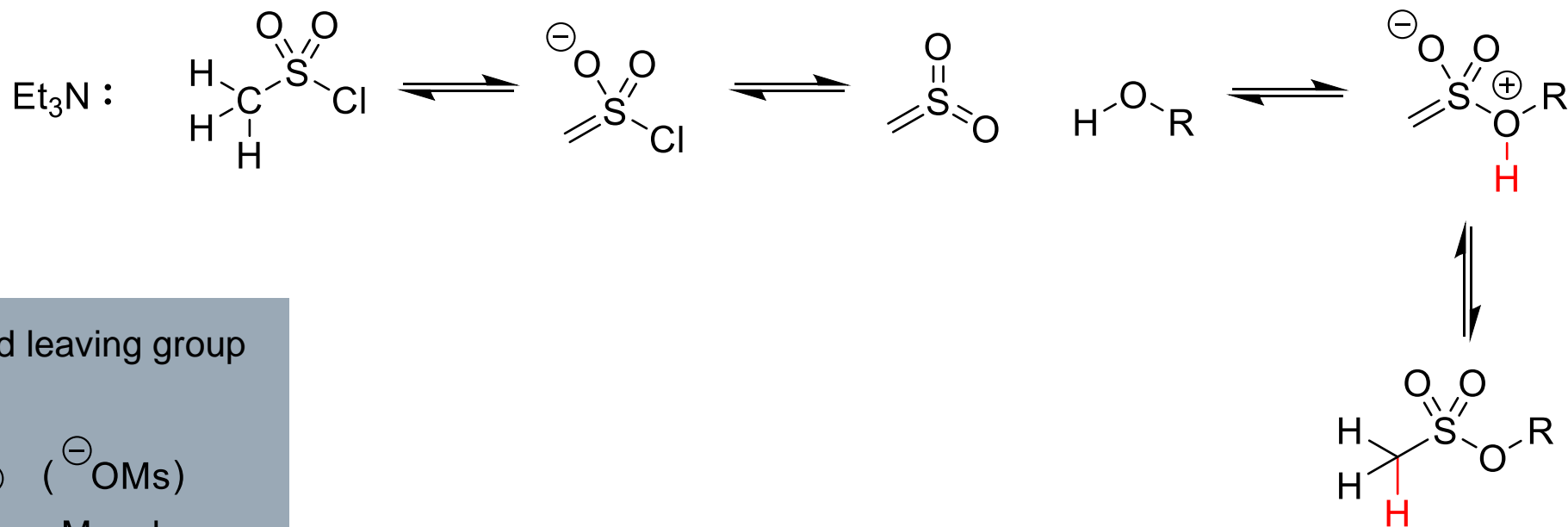
Esterification



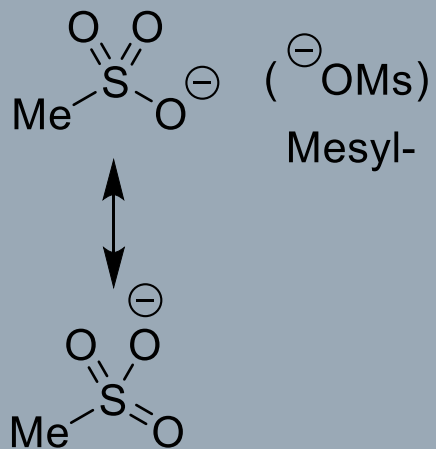
Eliminations and Substitutions

Analogous: Activation of -OH group by **mesylation** (in triethylamine as base)

NOTE: main difference to tosylation is the **α -hydrogen**

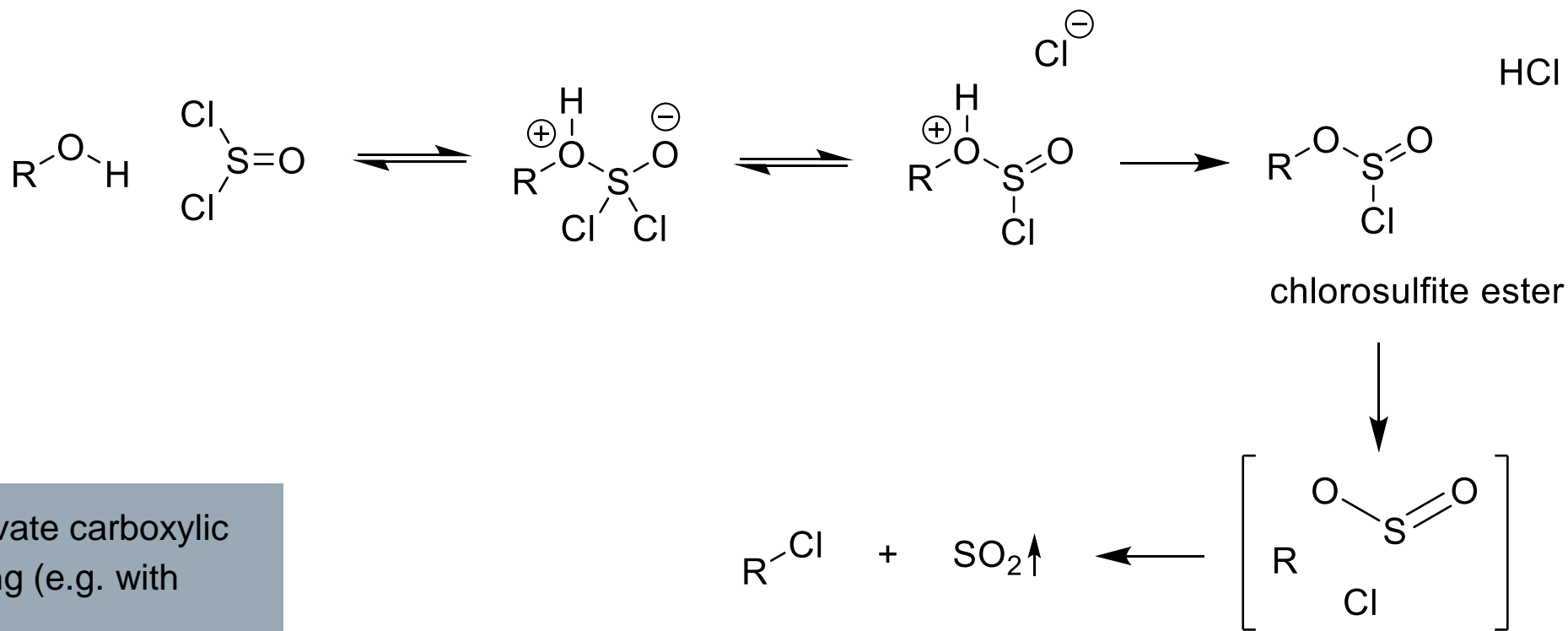


Mesylate – good leaving group

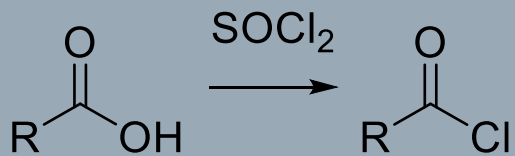


Thionyl Chloride

Can make alkyl chlorides (and acid chlorides) using thionyl chloride (SOCl_2)



One way to activate carboxylic acids for coupling (e.g. with amines):



What's next?

Introduction to Amines

Academic Insights #2

PhD student supervises a master student

