Synthesis of Alkynes Via N-Tosyl Hydrazones
Charles Dooley, Dr. Carolyn Weinreb
Department of Chemistry, Saint Anselm College

Abstract
The proposed method for formation of alkynes involves tosylation of ketones, formation of N-tosyl hydrazones, then base catalyzed formation of alkynes. Reactions were performed on acetophenone and pinacolone. The sulfonated pinacolone 2 was isolated in a 23.8% yield. N-Tosyl hydrazone 3 was formed in an 90% crude yield. Product 5 was isolated in a 59.3% yield, and was oxidized back to 2 in an 8.3% yield.

Introduction
• Alkynes can be synthesized by a variety of methods including elimination reactions, a Corey-Fuchs reaction, or a Seyferth-Gilbert homologation.
• Alkynes are useful in materials and found in anti-cancer drugs like dynemicin-A.
• The alkyne is formed through the reaction of an N-tosyl hydrazone with LiOH.
• Alkyne formation via N-tosyl hydrazones is an alternative method that allows alkyne formation in sterically hindered environments.
• The method was investigated using acetophenone and pinacolone.
• Phenyl disulfide was substituted for tosyl chloride because it is more substitution labile.

Reaction Schemes

Pinacolone

1) LDA @ -78°C 1 hour
2) TsCl, room temp 18-24 hours

Ts-Hydrazone
1 drop conc. HCl
CH₃CN 18 hours 90% Crude

N-Ts

LiOH
THF

(1) (2) (3) (4)

Alternative Method

1) LDA @ -78°C 1 hour
2) Ph₂S₂, room temp 18-24 hours 59.3%

Ts-Hydrazone
1 drop conc. HCl
CH₃CN 18 hours

N-Ts

KHSO₅
MeOH/H₂O 4 hrs, room temp 8.3%

(1) (2) (3) (4)

Results
• Product 2 was isolated in a 23.8% yield.
• Product 3 was synthesized with a 90% crude yield.
• An alternative method gave 5 in a 59.3% yield, and was oxidized to 2 via an oxone oxidation.

Discussion
• Acetophenone reactions gave no quantifiable yields.
• Sulfonated products are reacted with tosyl hydrazide to form N-tosyl hydrazones.
• A basic elimination occurs to form the desired alkyne.
• Pinacolone was used as an analog for the synthesis of alkynes proximal to sterically hindered sp³ centers.
• All reactions were characterized by ¹H NMR spectra and IR spectra.

Conclusion
• The sulfonation reaction works, but the method needs to be improved.
• Formation of N-tosyl hydrazones occurs but needs purification.

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