

Synthesis of Propargylic alcohol and its reactivity towards [2, 3] - Sigmatropic Rearrangement

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ABSTRACT

Synthesis propargylic alcohols, using Grignard reaction were carried out, and studied the reactivity towards [2, 3] - Sigmatropic rearrangement. All synthesized compounds were characterized by FT-IR, NMR spectroscopic techniques. The synthesized products were evaluated for their antibacterial activity against certain organisms like *klebsilla*, *S. aureus*. The result reveals that the compounds are having good biological activity.

SCOPE AND OBJECTIVES OF THE WORK

Allenes are useful intermediates in organic synthesis. The study of allene chemistry is well documented and reviewed. There are about 150 allene containing natural products have been isolated and considerable effort has been given to their synthesis, as well as to the study of their biological activity. Methods for transforming allenes into various other functionalities, often in a stereo selective manner, have attracted even more attention. Allenes can participate in cycloaddition, radical reaction, metalations and other processes. Furthermore, the superb ability of allenes to transfer axial chirality to new stereogenic centers is being increasingly exploited in synthetic applications. Hence the present study aims at, the synthesis of propargyl and vinylic alcohol and its transformation to allene via [2, 3] – Sigma tropic rearrangement.

Objectives of the work:

Synthesis of acetylenic and vinylic alcohols using Grignard's reagent. Synthesis of sulphenates. Study of its reactivity towards [2, 3] - Sigmatropic rearrangement.

Its characterization using FTIR, NMR spectroscopic techniques.

Evaluation of its Biological activity.

EXPERIMENTAL SECTION:

Materials: Ethylmethylketone, Vinyl magnesium bromide, Allyl bromide, Triethyl amine were used.

Method: It is a situ reaction carried out by two steps.

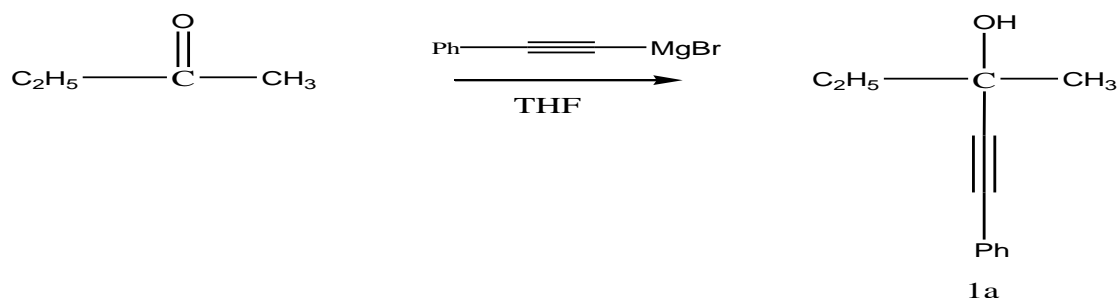
Techniques:

- IR Spectra were recorded in the range $4000 - 400\text{cm}^{-1}$ on Thermo Nicolet Avatar 330 FT-IT Spectrometer in KBr pellets.
- NMR Spectra were recorded in CDCl_3 with Bruker 300&400 MHz and JEOL 500 MHz high resolution NMR spectrometer with TMS as internal standards.

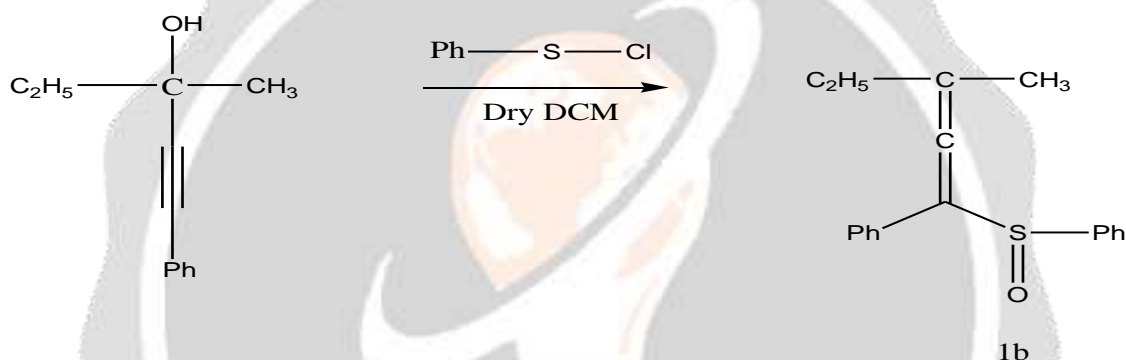
Step 1

Preparation of 3-Methyl-1-phenylpent-1-yn-3-ol from Ethylmethylketone (1a)

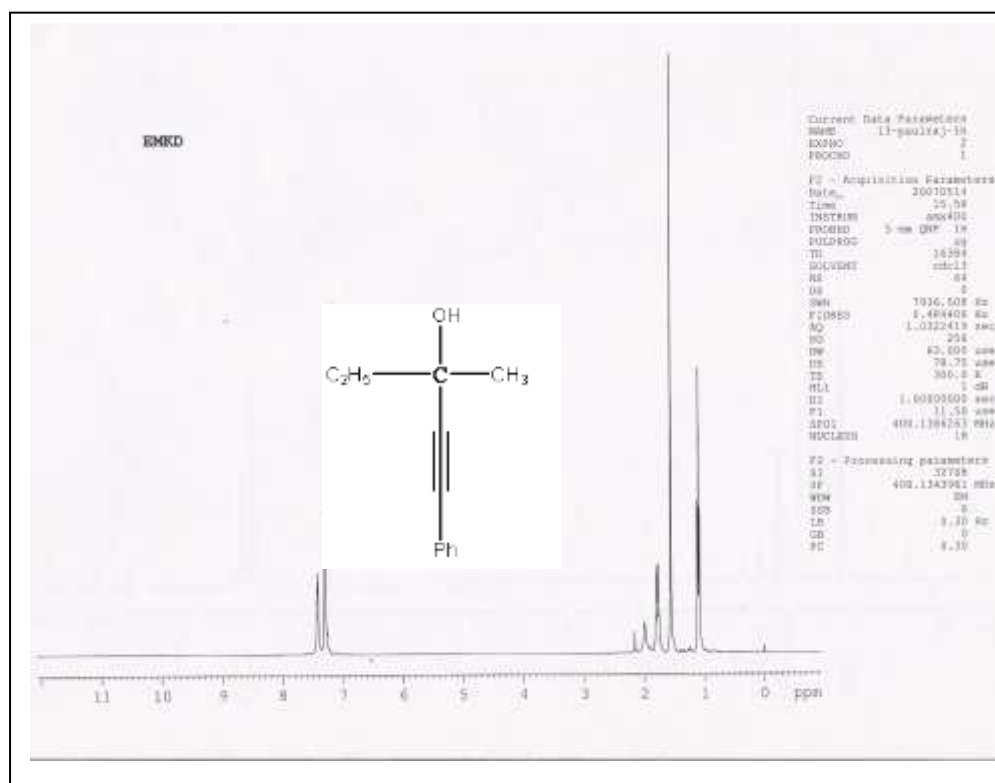
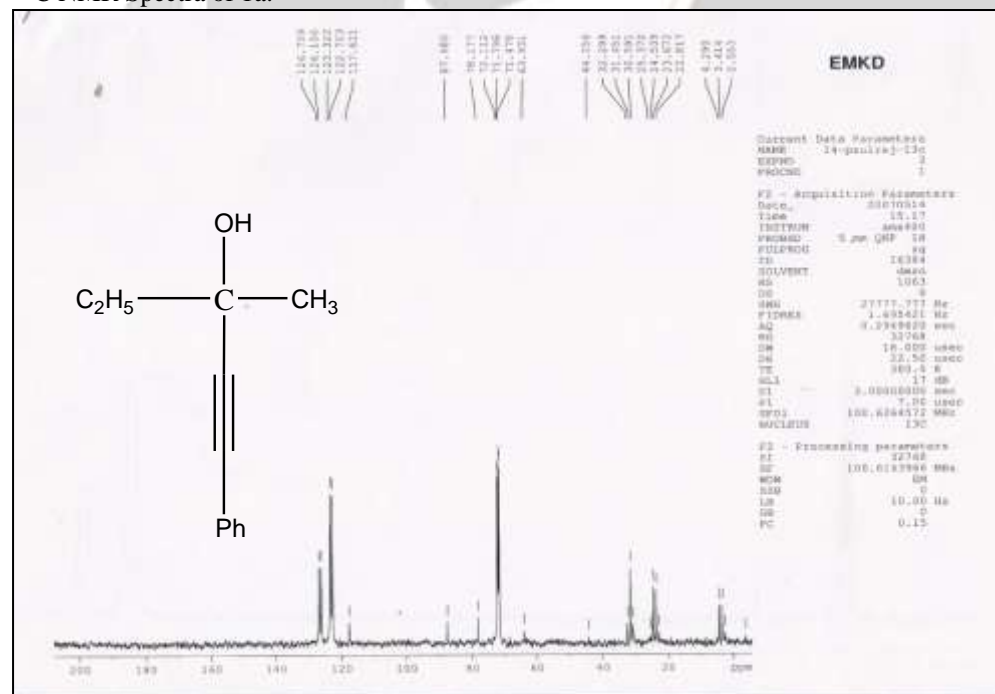
0.01mol of Mg was taken in 10ml of dry THF in a 250ml RB, to that catalytic amount of iodine was added. Then 0.01mol of allyl bromide dissolved in dry THF added drop wise with constant stirring. The iodine color started disappearing, stirring continued till all Mg reacted. To this 0.01mol of phenyl acetylene dissolved in 10 ml dry THF added. After 30 min 0.01 mol of ethylmethylketone in 10 ml dry THF was added. The contents were stirred for overnight. The completion of reaction was checked by TLC. To the reaction mixture saturated NH_4Cl added, the ether layer washed consecutively with 5% NaHSO_3 , water. After drying over anhydrous MgSO_4 and removal of solvent, the product was obtained as a viscous liquid. The crude product was purified by column chromatography.

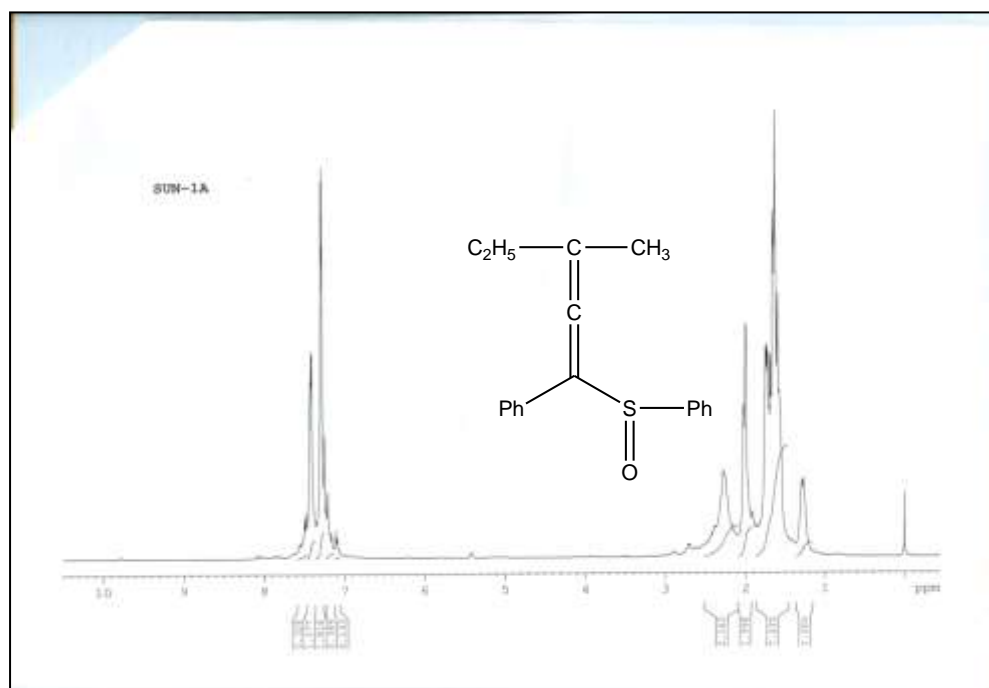
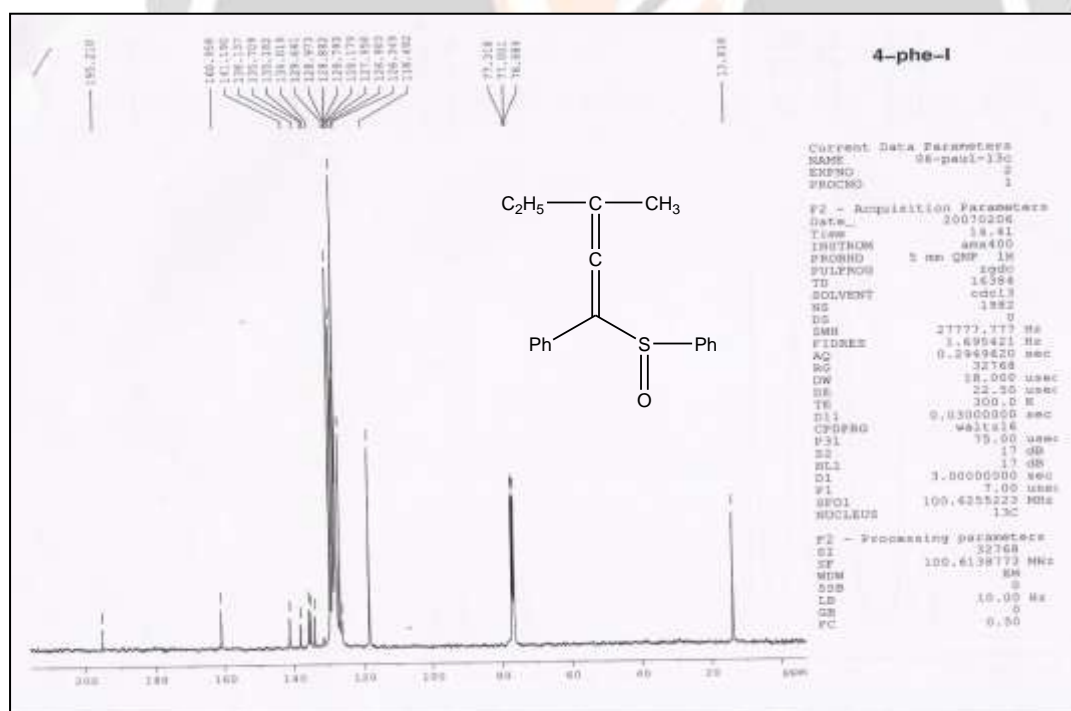
**Step 2****Synthesis of 1-(3-Methyl-1-(phenylsulfinyl)penta-1,2-dienyl)benzene (1b)**

To a rapidly stirred suspension of N-chlorosuccinimide in dry methylene chloride in the RB, added 0.01m of thiophenol. Initiation of the phenyl sulfinyl chloride formation is indicated by the intense orange coloration. Then the reaction mixture was cooled to 0°C. To this, a cooled solution of the 3-methyl-1-phenylpent-1-yn-3-ol in methylene chloride was added with stirring. After further stirring for overnight, the completion of reaction was checked by TLC. The reaction mixture was washed consecutively with 0.1N HCl, 5% NaHCO₃ and water. After drying over anhydrous MgSO₄ and removal of solvent, the product was obtained as a viscous liquid. The crude product was purified by column chromatography.

**FT-IR Spectral data of synthesized compounds**

S.No	Compound	IR Frequency cm ⁻¹
1	1a	3428 (OH Stretch), 3057 (Ar C-H Stretch), 2929, 2868 (Aliphatic C-H Stretch), 2201 (—C≡C—Ph Stretch).
2	1b	3057 (Ar C-H Stretch), 2929, 2868 (Aliphatic C-H Stretch), 1943 (C=C=C Stretch), 1023 (S=O Stretch).

¹H NMR Spectra of 1a¹³C NMR Spectra of 1a:

¹H NMR Spectra of 1b¹³C NMR Spectra of 1b**ANTIBACTERIAL ASSAY:**

The compounds were evaluated for their in vitro antibacterial activity against *Klebsilla* and *S. Aureus* by the agar-well diffusion method. Bacteria were inoculated into Nutrient broth and incubated for 3hr. The test solutions were prepared in DMSO. Wells were made on the seeded plates using a sterile borer (7mm), after which 200 micro liter of the test solutions and the controls were dispensed in to each well using micropipette. The concentration of the test samples were 0.01g /10 ml of DMSO. The plates were incubated at 37° C for 24

hrs during which activity was evidenced by the presence of the zone of inhibition surrounding the well. Zone sizes were measured in mm compared to the control.

Zone of inhibition for 1b against *Klebsilla*

Compound	Zone of inhibition (mm)
1b	4 mm

Zone of inhibition for 1b against *S. Aureus*

Compound	Zone of inhibition (mm)
1b	5 mm

CONCLUSION:

Synthesis of various propargylic and vinylic alcohols, using Grignard reaction were carried out, and studied the reactivity towards [2, 3] - Sigmatropic rearrangement. All synthesized compounds were characterized by FT-IR, NMR spectroscopic techniques. The synthesized products were evaluated for their antibacterial activity against certain organisms like *klebsilla*, *S. Aureus*. The result reveals that the compounds are having good biological activity.

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