

## Acidity of Terminal Alkynes:

Alkanes are undoubtedly the weakest Brønsted acids commonly encountered in organic chemistry. It is difficult to measure such weak acids, hybridizing the carbon so as to increase the s-character of the C-H increases the acidity, with the greatest change occurring for the sp-C-H groups found in terminal alkynes.

This increase in acidity permits the isolation of insoluble silver and copper salts of such compounds.



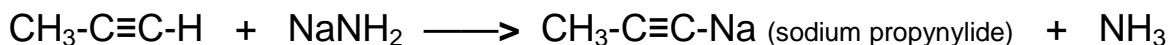
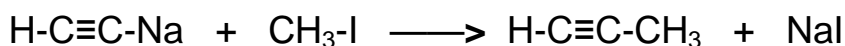
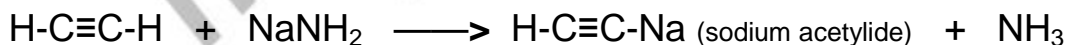
Despite the dramatic increase in acidity of terminal alkynes relative to other hydrocarbons, they are still very weak acids, especially when compared with water, which is roughly a billion times more acidic.

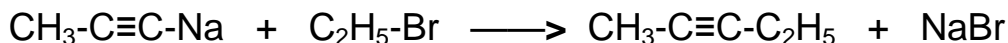
If we wish to prepare nucleophilic salts of terminal alkynes for use in synthesis, it will therefore be necessary to use a much stronger base than hydroxide anion. Such a base is sodium amide ( $\text{NaNH}_2$ ), discussed above, and its reactions with terminal alkynes may be conducted in liquid ammonia or ether as solvents. The products of this acid-base reaction are ammonia and a sodium acetylide salt. Because the acetylide anion is a powerful nucleophile

This synthesis application is described in the following equations.

The first two equations show how acetylene can be converted to propyne

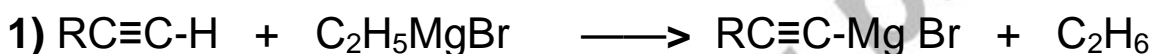
The last two equations present a synthesis of 2-pentyne from propyne.





Because  $\text{RC}\equiv\text{C:}^{(-)}\text{Na}^{(+)}$  is a very strong base roughly a billion times stronger than NaOH

The enhanced acidity of terminal alkynes relative to alkanes also leads to metal exchange reactions when these compounds are treated with [Grignard reagents](#). This exchange, shown below in equation 1, can be interpreted as an acid-base reaction which, as expected, proceeds in the direction of the weaker acid and the weaker base. This factor clearly limits the usefulness of Grignard or lithium reagents when a terminal triple bond is present, as in equation 2.



The acidity of terminal alkynes also plays a role in product determination when vicinal (geminal) / di-halides undergo base induced bi-elimination reactions.

For complete SLO's Preparation email to: [akber.khursheed@gamil.com](mailto:akber.khursheed@gamil.com)