A challenge organic chemists face in the laboratory when planning a transformation or modification of a functional group in a polyfunctional compound is the possibility of unintended changes in the other functional groups in lieu of or in addition to the intended change.

eg: Terminal alkyne 1 can be converted to internal alkyne 2 by treating 1 with a very strong base, such as $\text{NH}_2$, followed by an ethyl substrate.

$\text{CH}_3\text{CH}_2\text{C}≡\text{C}≡\text{H} + \text{NH}_2$ $\rightarrow$ $\text{CH}_2\text{CH}≡\text{C}≡\text{C}≡\text{CH}_3$

However, 3 cannot be converted to 4 using the same two-reaction sequence.

In 3, the most acidic hydrogen atom is not the alkynyl hydrogen but the hydrogen atom in the alcohol group. Consequently, treatment of 3 with the base results in the base deprotonating the alcohol group in 3 giving an alkoxide ion, which reacts with the substrate yielding 5, not 4, as the organic product.

In order to convert 3 to 4 using the methodology employed to convert 1 to 2, the alcohol group in 3 must first be removed temporarily. One way to do so is to convert the alcohol group into a silyl ether group.

In 6, the most acidic hydrogen is the alkynyl hydrogen. Treatment of 6 with $\text{NH}_2$, followed by the substrate results in 7.

Replacement of the silyl ether group in 7 with the alcohol group yields 4.

In the overall reaction (? + ? + ?), the silyl ether is said to act as the protecting group of the alcohol group; reaction ? is known as the protection step and reaction ? the deprotection step.

Contributors

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