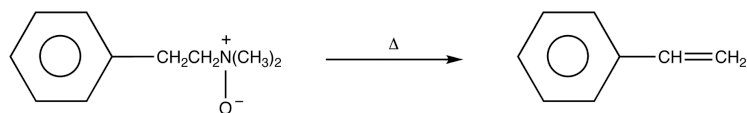
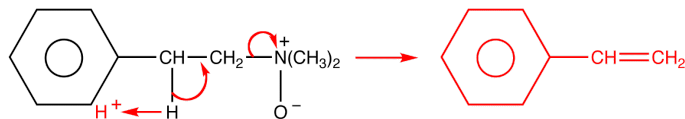


## 20.9: OXIDATION OF AMINES - THE COPE ELIMINATION

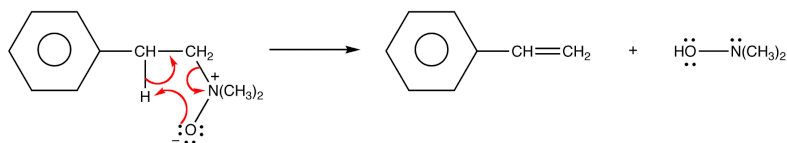
When a tertiary amine oxide bearing one or more beta hydrogens is heated, it is converted to an [alkene](#). The reaction is known as *Cope elimination* or *Cope reaction*, not to be confused with [Cope Rearrangement](#). For example:



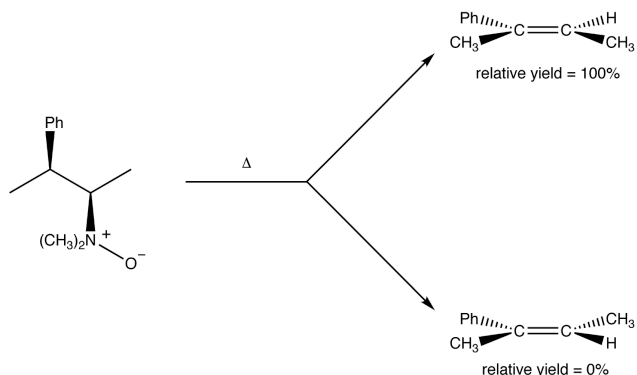
The net reaction is [1,2-elimination](#), hence the name Cope elimination.



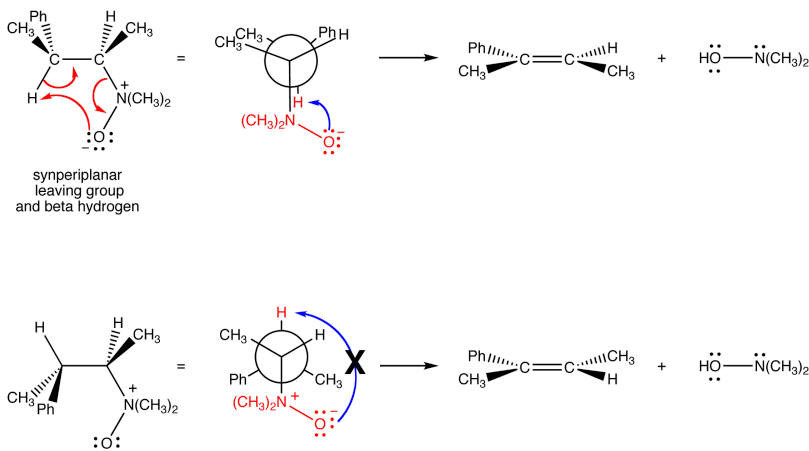
mechanism: Cope elimination is an intramolecular E2 reaction. It is also a [pericyclic reaction](#).



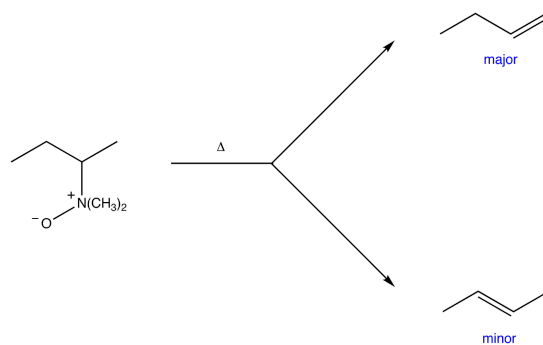
Intermolecular E2 reactions occur preferentially from the conformation of the substrate in which the leaving group and the beta hydrogen abstracted by the base are antiperiplanar, which is not possible in intramolecular E2 reactions in which the base is built into the leaving group because the basic atom is too far away from the beta hydrogen anti to the leaving group. Intramolecular E2 reactions occur preferentially from the conformation of the substrate in which the leaving group and the beta hydrogen abstracted by the base are synperiplanar. The basic atom and the beta hydrogen abstracted by it are closest to each other in this conformation. For example:



mechanism:



Cope elimination is regioselective. Unlike intermolecular E2 reactions, it does not follow Zaitsev's rule; the major product is always the least stable alkene, i.e., the alkene with the least highly substituted double bond. For example:



This trend is most likely due to the fact that the less highly substituted  $\beta$ -carbon bears more hydrogen atoms than the more highly substituted one; at a given moment, in a sample of the substrate, there are more molecules in which a hydrogen atom on the less highly substituted beta carbon is *synperiplanar* to the leaving group than there are in which a hydrogen atom on the more highly substituted beta carbon is.

## CONTRIBUTORS AND ATTRIBUTIONS

- [Gamini Gunawardena](#) from the [OChemPal](#) site ([Utah Valley University](#))

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