ORGANIC CHEMISTRY 1 LECTURE GUIDE 2019

BY RHETT C. SMITH

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Organic Chemistry 1
Lecture Guide 2019

By Rhett C. Smith, Ph.D.

Companion Books from the Proton Guru:

Organic Chemistry 1 Reactions and Practice Problems 2019

by Rhett C. Smith

Organic Chemistry 1 Primer 2019,

by Rhett C. Smith, Andrew G. Tennyson, and Tania Houjeiry

Lecture Topic III.2: Properties of Alkenes and Hydrogenation of Alkenes
Saturated versus Unsaturated Compounds

Alkanes: C_nH_{2n+2} **saturated** hydrocarbons
Alkenes: C_nH_{2n} **unsaturated** hydrocarbons (put a double bond in an alkane)
(olefins)

Each removal of two hydrogens from a saturated hydrocarbon (alkane) is one degree of unsaturation (can add one H_2 molecule to it)

A **degree of unsaturation** can be:

A

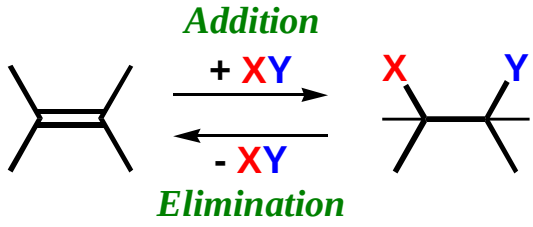
A general formula to determine the degree of unsaturation of a molecule from its formula ($C_cH_hN_nO_oX_x$, where X = F, Cl, Br or I) is:

B

*Note that oxygen's presence does not impact the degree of unsaturation

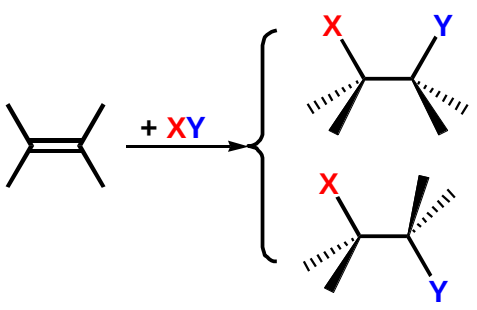
Notes

Alkenes can be prepared by elimination reactions. Alkenes can also undergo



A

A stereochemical/mechanistic issue to be addressed is whether a given addition reaction occurs with the resultant substituents adding *syn*- or *anti*- to one another:



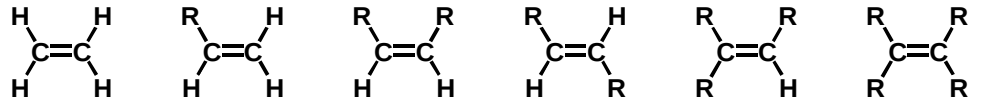
B

C

Notes

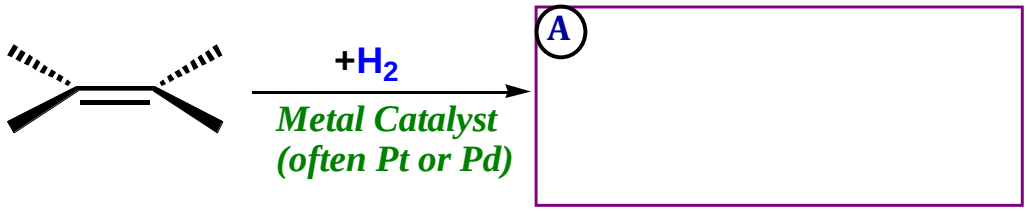
We have observed the following trend in alkene stability:

1. More substituted = More stable



LESS STABLE MORE STABLE

These stabilities are determined by doing a **hydrogenation** of the alkene and measuring the heat given off by the process. Hydrogenation (**addition of two H atoms to the pi bond**) is accomplished by reacting with $H_2(g)$ and a Pd or Pt catalyst:



Notes