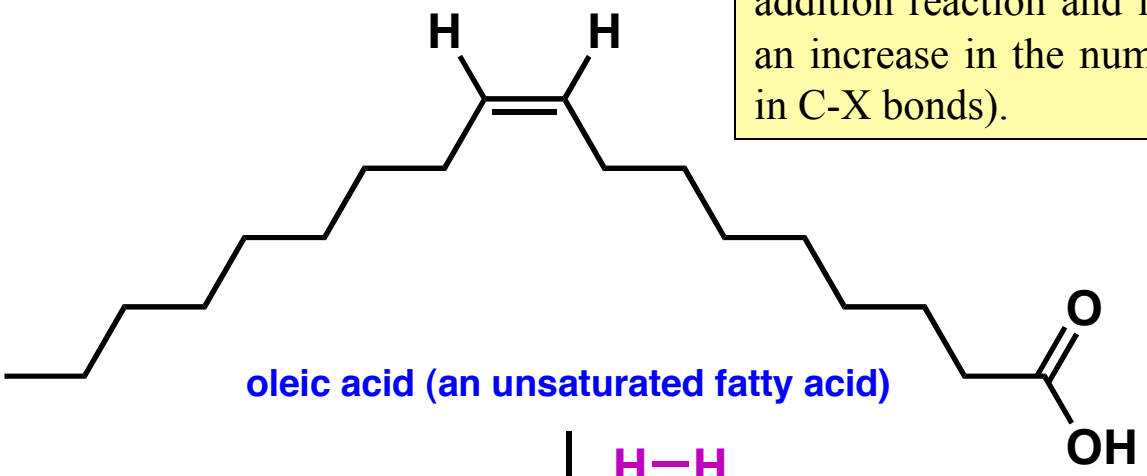
Addition of Hydrogen to Alkenes and Alkynes

The addition of hydrogen to an organic compound is called hydrogenation. An example is shown. Hydrogenation is an addition reaction and it is also a **reduction** reaction (there is an increase in the number of C-H bonds without an increase in C-X bonds).

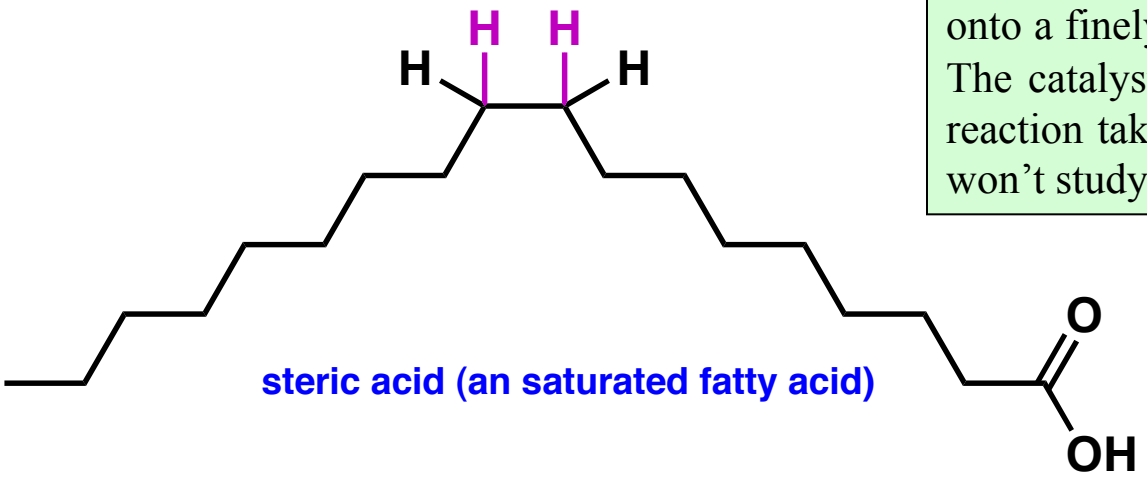


oleic acid (an unsaturated fatty acid)

Pd-C

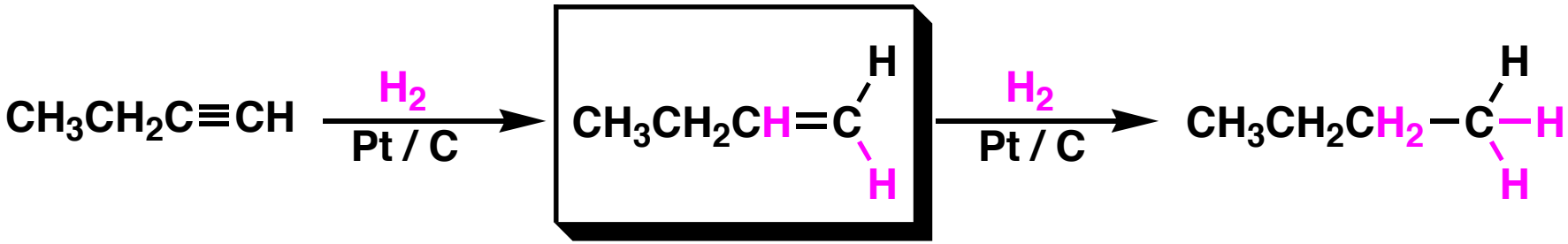
H—H
hydrogen

The addition of H_2 occurs only in the presence of a metal catalyst (Pd, Pt or Ni) that is adsorbed onto a finely divided inert solid, such as charcoal. The catalyst 10% Pd on carbon is common. The reaction takes place at the metal's surface but we won't study the details.

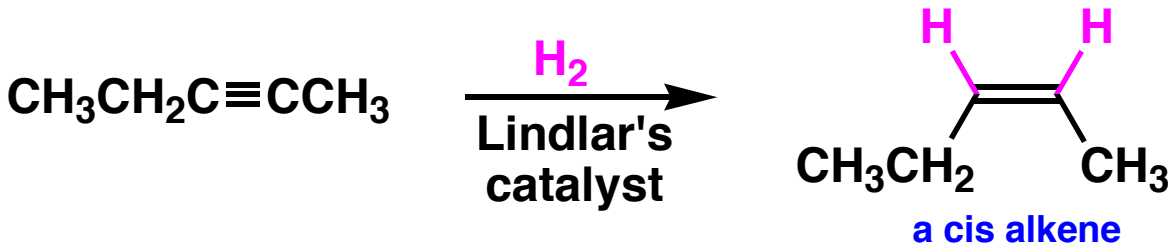


steric acid (an saturated fatty acid)

Alkynes Usually Undergo Successive Hydrogen Addition



Hydrogen adds to alkynes in an analogous way as with alkenes. The initially formed alkene generally continues on to the saturated alkane under the reaction conditions.



a cis alkene

The addition of H_2 to triple bonds is somewhat faster than to alkenes; thus, it is possible to stop the reaction at the alkene using a type of "poisoned" or deactivated catalyst known as Lindlar's catalyst. Lindlar's catalyst is stereoselective for the formation of the cis alkene.

http://wps.prenhall.com/wps/media/objects/724/742058/0024f.html