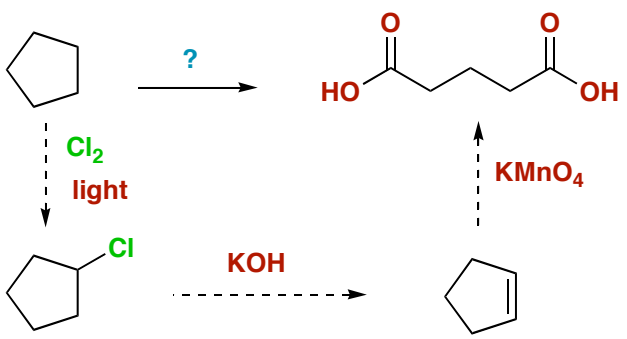
Chapter 7 - Alkenes: Reactions and Synthesis

Synthetic Strategy

One of the basic goals of organic chemists is to make molecules. Usually this requires a multi-step synthesis starting from materials that are readily available from petroleum products or plant materials. In order to carry a multi-step synthesis it takes strategic planning. The best way to approach a synthetic challenge is to analyze the target structure and work backwards one step at a time until you get back to your starting materials. As we build our repertoire of organic functional group transformations, we will come back to this issue of synthetic strategy.



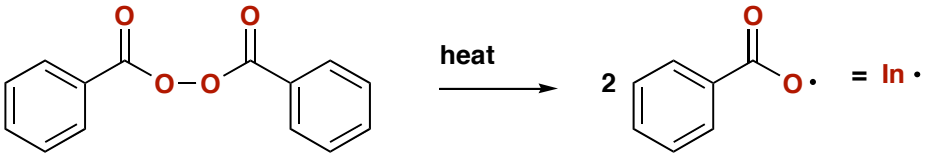
Say you were given cyclopentane as a starting material. How would you prepare 1,5-pentandioic acid? This would require a multistep synthesis, as there are no methods to carry out this transformation in one step.

Working backwards, we could see that the diacid could be prepared in one step from cyclopentene and potassium permanganate.

Cyclopentene can be prepared by elimination of chlorocyclopentane, and this can be prepared from cyclopentane by free radical chlorination.

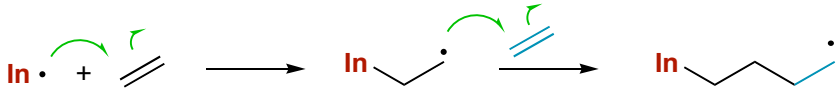
Alkene Polymerization

Polymers can be produced from alkenes by chain reactions using either radical or cationic polymerization. These reactions are initiated by either a radical source, like benzoylperoxide, or a cation source like a strong acid.

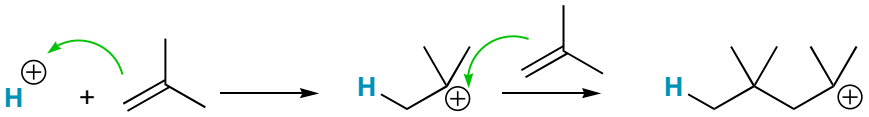


benzoylperoxide

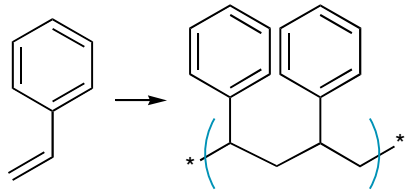
radical polymerization is often initiated by the formation of benzoyl radicals from benzoyl peroxide.



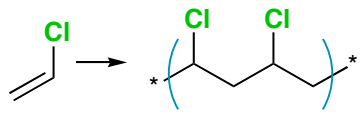
The chain grows by sequential addition of radicals to ethylene.



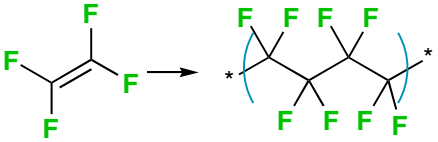
Cationic polymerizaiton grows chains in the same fashion.



polystyrene



polyvinylchloride
PVC



Teflon