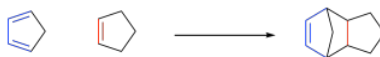


1.7: Other Polymers

The principle of functionality means that almost any type of organic reaction could potentially be used to make polymers. For instance, if a compound has two functional groups of the same kind, it could undergo reaction at two different sites, forming new bonds with two neighbors. The compound thereby becomes enchain in a trio of formerly independent molecules. If the neighboring molecules are also difunctional, then this pattern can repeat, forming a polymer.

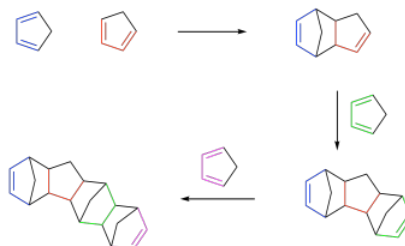
Take the Diels Alder reaction as an illustrative example. On paper, the reaction is fairly straightforward, even if it isn't all that common. A molecule with a pair of conjugated alkenes, the diene, cyclizes with another alkene, the dienophile, to form a new six-membered ring, a cyclohexene.



The diene needs two double bonds but the dienophile only needs one. Nevertheless, what happens if the dienophile has an extra double bond? The Diels Alder adduct that forms would end up with two double bonds: one formed from the original diene, as always, and the other leftover from the dienophile.



The resulting compound is a difunctional alkene. Each end of this molecule could potentially undergo another Diels Alder reaction with an additional diene. Each time that reaction occurs, a new alkene is left behind where the diene used to be, preserving that difunctionality for another step. That difunctionality forms the basis for potential polymer chemistry.



In fact, Diels Alder reactions have been exploited by researchers in a number of ways to make materials with useful properties. The fact that six-membered rings are introduced along the backbone, rather than a chain of single bonds, means that these materials display varying levels of conformational rigidity, resulting in some unique properties.

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