Conjugated Systems Diels Alder Reactions

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Diels-Alder Reaction

- Otto Diels, Kurt Alder; Nobel prize, 1950
- Conjugate dienes can combine with alkenes to form six-membered cyclic compounds
- The formation of the ring involves no intermediate (concerted formation of two bonds)
- Diene + dienophile will give an adduct/product



Examples of Diels-Alder Reactions



Mechanism - Concerted

There is no clear nucleophile or electrophile.



Dienes and Dienophiles



Groups on Dienes and Dienophile



Stereospecificity in Diels-Alder Reaction



Regioselectivity of Diels-Alder Reaction

Reactants align to produce *endo* (rather than *exo*) product. *Endo* and *exo* indicate relative stereochemistry in bicyclic structures.



Maleic anhydride

Conformation of the Diene

- The relative positions of the two double bonds in the diene are "cis" or "trans" to each other about the single bond (being in a plane maximizes overlap)
- These conformations are called s-cis and s-trans ("s" stands for "single bond")
- Dienes react in the *s*-cis conformation in the Diels-Alder reaction



Successful reaction

No reaction (ends too far apart)

Key Concepts

- Diene Dienophile
- Electron withdrawing and donating groups.
- Stereoselectivity
- Regioselectivity
- Conformation of the diene