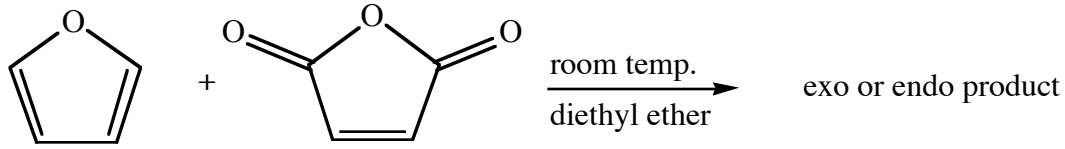
# The Diels Alder Reaction




furan maleic anhydride

## Experimental Procedure:

Note: Maleic anhydride will react with water, so your equipment must be dry! (What is the product of the reaction of maleic anhydride with water?)

Dissolve 1.30 g of maleic anhydride in 10 mL of anhydrous diethyl ether in a 50 mL Erlenmeyer flask. The maleic anhydride make take a little while to dissolve, so it may be necessary to break up any clumps and to warm the mixture gently with a hot plate in order to dissolve the solid.

After the solid has dissolved, add 1.0 mL of furan to the maleic anhydride-ether solution using a pipette or syringe. Cork the flask tightly, and wrap parafilm around the cork. Place this solution in your lab locker overnight and let the reaction happen!

Collect any crystals that have formed by vacuum filtration using the Hirsch funnel. Wash the product with 2-3 mL of cold diethyl ether.

Determine the weight, percent yield, and the melting point of your product. In addition, take the IR and NMR spectra of your product.

## Additional information:

While the reaction is proceeding, make models of the products arising from the endo transition state and the exo transition state. In particular, note the dihedral angles between the hydrogen alpha to the carbonyl and the hydrogen alpha to the ether oxygen. The coupling constant between different hydrogens on adjacent carbons depends on the dihedral angle between these hydrogens. The coupling constant approaches zero when this angle is 90°, and reaches a local maximum at angles of 0° and 180°. The relationship is shown graphically by the Karplus curve. Your instructor will talk more about this. Which of the two possible products will have the smallest coupling constant between the two hydrogens indicated above? Based on the splitting seen in the attached NMR's (and the NMR you will obtain!), which product have you obtained? You can verify this by determining the melting point of your product.

The MP of the endo product is 70 °C.
The MP of the exo product is 115 °C.

| Molecule | Strain energy | Dihedral Angle | Coupling Constant |
|---|---|---|---|
| *exo* product | | | |
| *endo* product | | | |