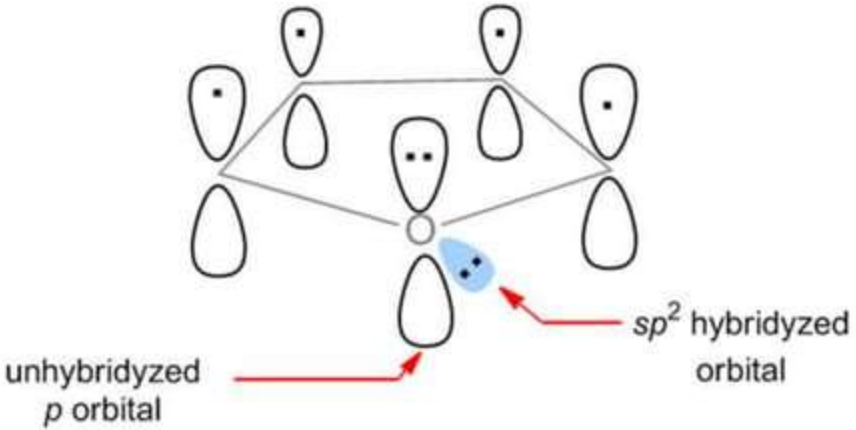
Properties

1. Aromaticity



Properties

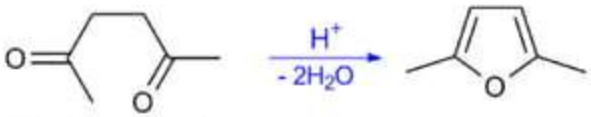
1. Aromaticity

- Furan have 4 C and 1 O , all are sp^2 hybridized
- sp^2 hybridization is planar, it makes a planar furan ring structure.
- Each ring atom also contains unhybridized p orbital that is perpendicular to the plane of σ bonds (plane of ring).
- Here p orbitals are parallel to each other, so overlapping btwn p orbitals is possible.
- the total nu of non bonding e- are 6 (4 of four C, 2 from one O)
- The resonance of 6 e- follows the Hückel's rule
- So the furan is aromatic .

Synthesis

1. Paal-Knorr synthesis of furan

- Acid catalysed ,cyclising dehydration of 1,4 - dicarbonyl compounds.

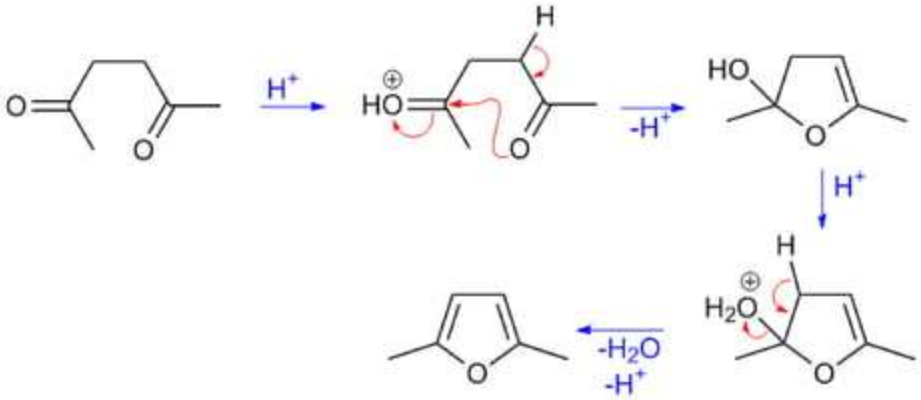


1,4 - Dicarbonyl compounds

Synthesis

1. Paal-Knorr synthesis of furan

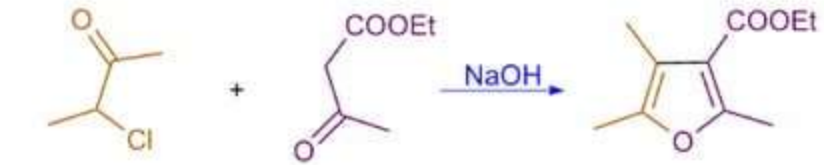
Mechanism



Synthesis

2. Feist – Benary Synthesis

- Reaction of α- haloketones with β-ketoesters in the presence of a base (not ammonia) to give furans.

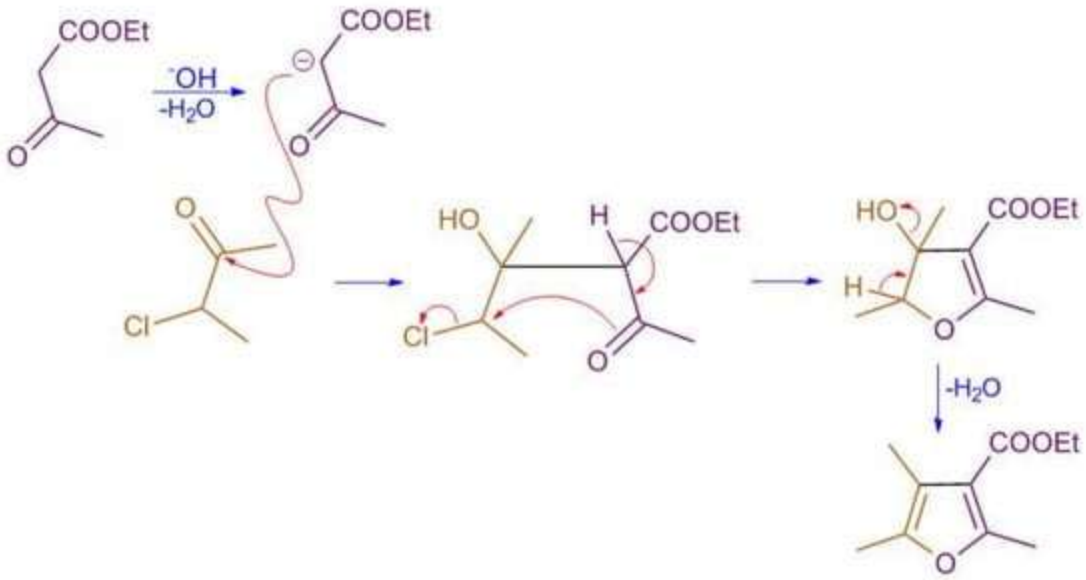


α- haloketones Activated Ketone

Synthesis

2. Feist – Benary Synthesis

Mechanism

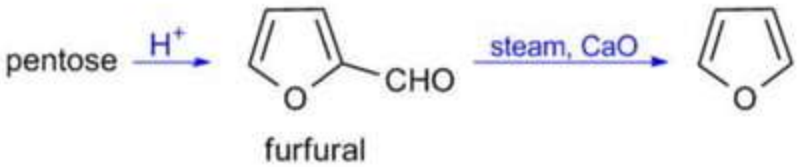


Synthesis

3. From carbohydrate

Step_1: distillation of CH with sulfuric acid

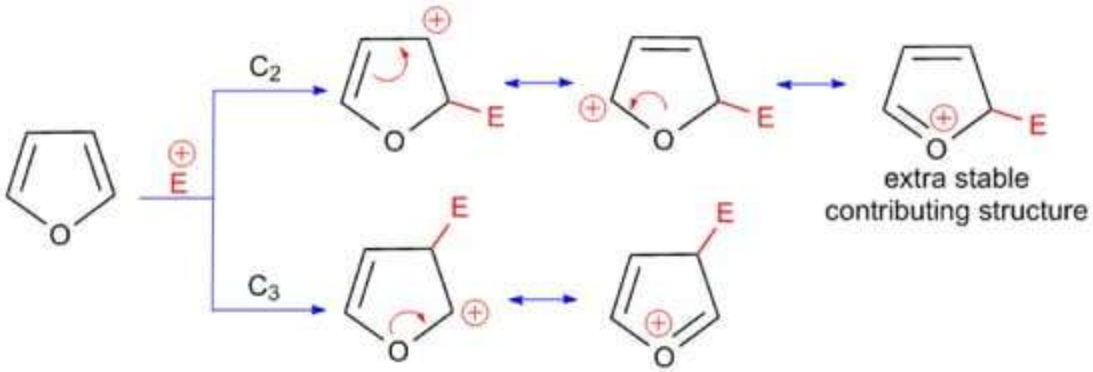
Step_2: catalytic decomposition of furfural in steam



Reactions

1. Electrophilic substitution

furan undergoes electrophilic substitution reaction at 2nd position



2 reasons…

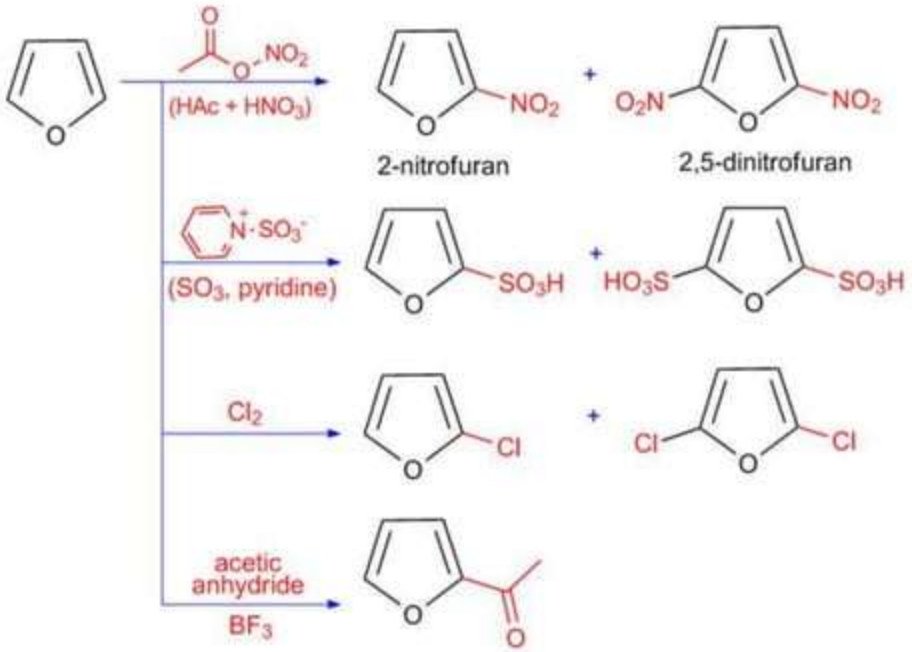
- C2 attack gives more resonance contributing structures than C3.
- Extra stable contributing structure generates upon C2 attack

Reactions

1. Electrophilic substitution

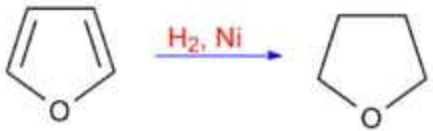
Reactions

1. Electrophilic substitution



Reactions

2. Reduction



tetrahydrofuran

Reactions

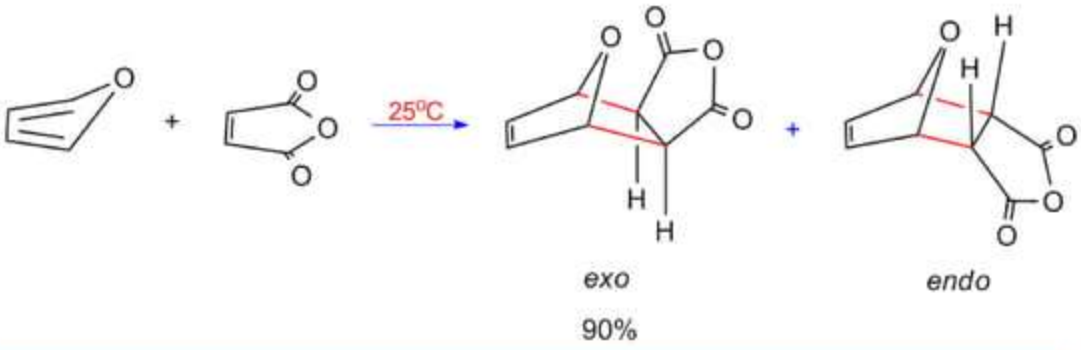
3. Diels-Alder reaction

- O atom is highly electronegative, so the delocalization of lone pair e- (in aromatic system of furan) is not overly effective.
- Thus…Furan can behave as a dienophile and gives 4 + 2 cycloaddition.

dimethyl maleate adduct

Reactions

3. Diels-Alder reaction



Reactions

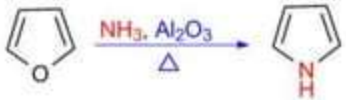
4. Pyrrole synthesis

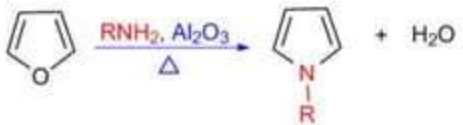
PYRROLE

Synthesis

1. From Furans

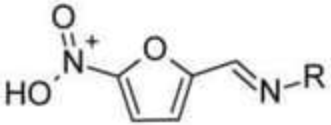
- Industrial process
- Passing furan over ammonia in presence of alumina as catalyst at high temp.





Medicinal uses

(1) Nitrofurans: *Nitrofurazone, Furazolidone, Nitrofurantoin* , Anti-infective Agents: used as an antiprotozoal agent to treat trypanosomiasis and leishmaniasis



(2) *Ranitidine:* Antihistaminic Agents, used in peptic ulcer