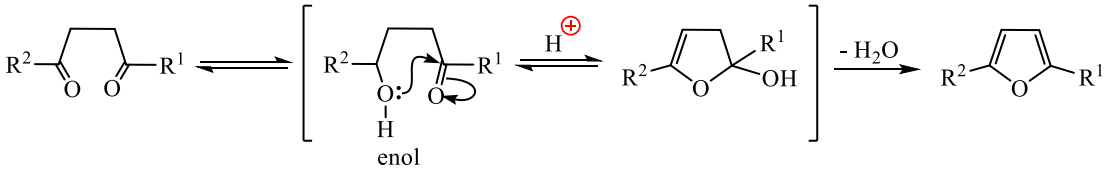
6.2) Synthetic methods:

Many routes have been used to synthesize furan ring as the following:

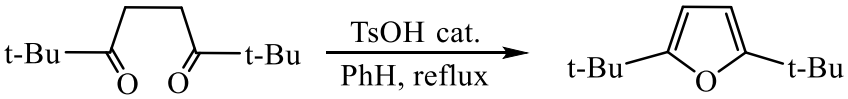
6.2.1) from 1,4-dicarbonyl compounds (the Paal – Knorr method):

In general 1,4-dicarbonyl compounds can be dehydrated with acids to give furans, since the 1,4-dicarbonyl compounds provide all of carbon and oxygen atoms for the nucleus.



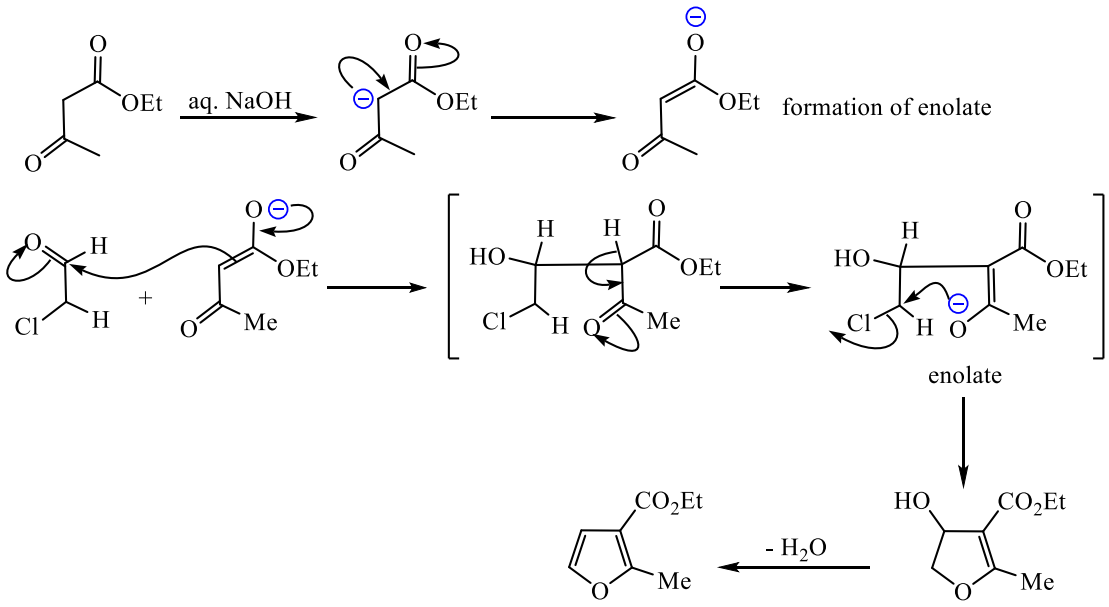
The process involve the addition of the enol oxygen of one carbonyl group to the other one followed by elimination of water.

e.g.



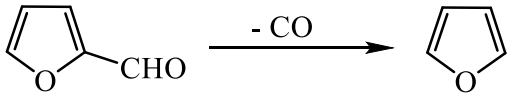
6.2.2) From α-halocarbonyl (the Feist – Benary synthesis):

α-halocarbonyl compounds react with 1,3-dicarbonyl compounds in the presence of a base (not ammonia) to give furans.

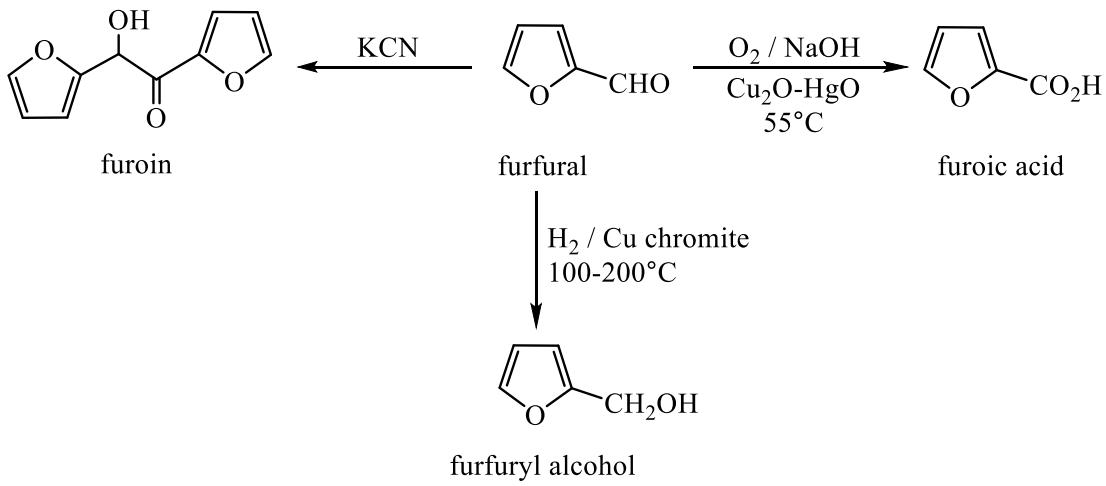


The reaction proceed initially via aldol condensation at the carbonyl of 2-halocarbonyl component; ring closure occur through an intramolecular displacement of halide by enolate oxygen.

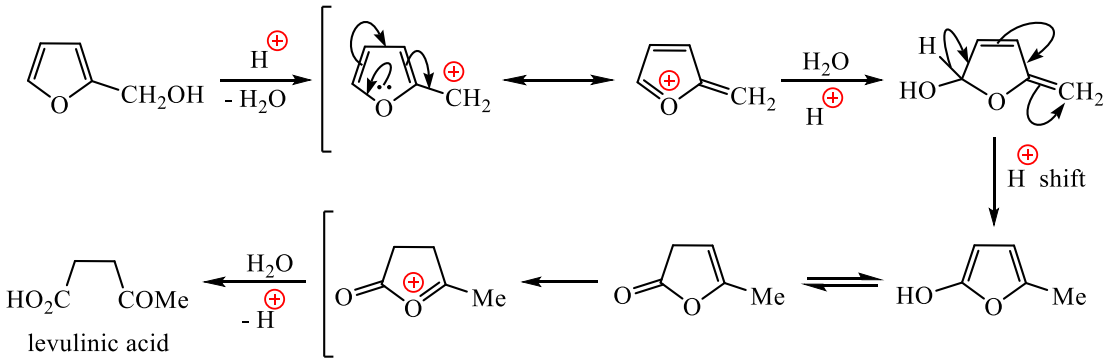
Another method for furan synthesis involve loss of carbon monoxide from furfural.



Furfural is an important furan derivative since it has been used as a precursor to synthesize a number of different important compounds as the following:

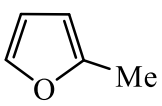


Fufuryl alcohol can be used as a precursor for the synthesis of levulinic acid as the following:

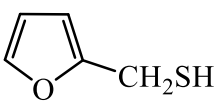


6.4) Naturally occurring furan compounds:

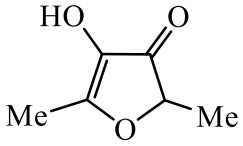
Furan ring exist in a number of naturally occurring compounds as a main component, since 2-methylfuran exist in wood oil (1), furfuryl mercaptan (furan-2-yl methan thiol) in roasted coffee (2), compound (3) in pineapple, compound (4) in potato, furthermore furacine (5) have been used as antibacterial drug.



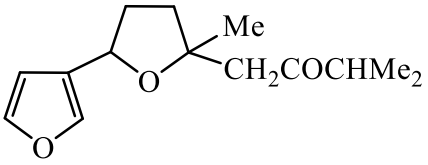
(1)



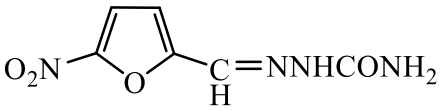
(2)



(3)



(4)



(5)