

Furan

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(Redirected from Furans)

Furan is a heterocyclic organic compound, consisting of a five-membered aromatic ring with four carbon atoms and one oxygen. The class of compounds containing such rings are also referred to as furans. The parent compound is typically derived by the thermal decomposition of pentose-containing materials, cellulosic solids especially pine-wood. Furan is a colorless, flammable, highly volatile liquid with a boiling point close to room temperature. It is toxic and may be carcinogenic. Catalytic hydrogenation (see redox) of furan with a palladium catalyst gives tetrahydrofuran.

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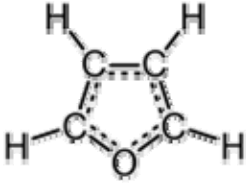
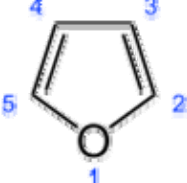
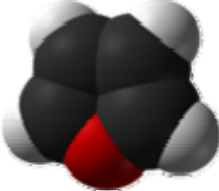
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History

The name *furan* comes from the Latin *furfur*, which means bran.^[2] The first furan derivative to be described was 2-furoic acid, by Carl Wilhelm Scheele in 1780. Another important derivative, furfural, was reported by Johann Wolfgang Döbereiner in 1831 and characterised nine years later by John Stenhouse. Furan itself was first prepared by Heinrich Limpricht in 1870, although he called it *tetraphenol*.^{[3][4]}

Synthesis and isolation

- Furan can be obtained from furfural by oxidation and decarboxylation of the resulting furan-2-carboxylic acid, the furfural being

Furan	
	
	
IUPAC name	
Furan	
Other names	
Oxole, furfuran, furane (misspelling) ^[1] , divinylene oxide, 1,4-epoxy-1,3-butadiene, 1,4-epoxybuta-1,3-diene	
Identifiers	
CAS number	110-00-9 ✓
PubChem	8029
ChemSpider	7738
SMILES	c1ccoc1
InChI	InChI=1/C4H4O/c1-2-4-5-3-1/h1-4H
InChI key	YLQBMQCUIZJEEH-UHFFFAOYAC
Properties	
Molecular formula	C ₄ H ₄ O
Molar mass	68.07 g/mol
Appearance	colorless, volatile liquid
Density	0.936 g/mL
Melting point	-85.6 °C
Boiling point	31.4 °C

derived by destructive distillation of corn cobs in the presence of sulfuric acid.^[5]

- A classic furan organic synthesis is the Feist-Benary synthesis.
- One of the most simple synthesis methods for furans is the reaction of 1,4-diketones with phosphorus pentoxide (P₂O₅) in the Paal-Knorr Synthesis. It is interesting that the thiophene formation reaction of 1,4-diketones with Lawesson's reagent also forms furans as side products.

Chemistry

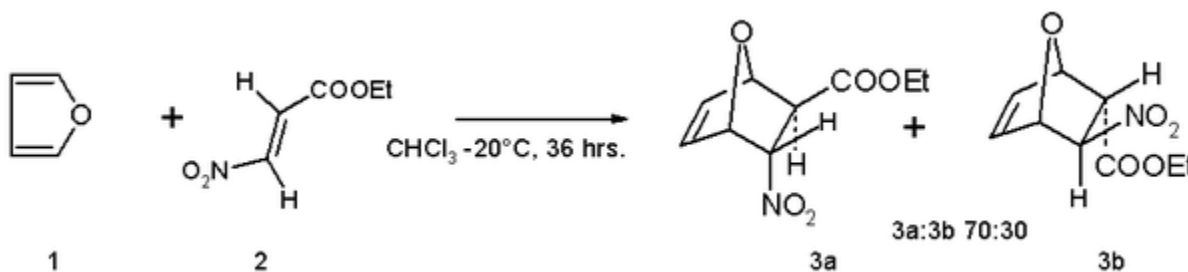
Furan is aromatic because one of the lone pairs of electrons on the oxygen atom is delocalized into the ring, creating a 4n+2 aromatic system (see Hückel's rule) similar to benzene. Because of the aromaticity, the molecule is flat and lacks discrete double bonds. The other lone pair of electrons of the oxygen atom extends in the plane of the flat ring system. The sp² hybridization is to allow one of the lone pairs of oxygen to reside in a p orbital and thus allow it to interact within the pi-system.

Due to its aromaticity, furan's behavior is quite dissimilar to that of the more typical heterocyclic ethers such as tetrahydrofuran.

- It is considerably more reactive than benzene in electrophilic substitution reactions, due to the electron-donating effects of the oxygen heteroatom. Examination of the resonance contributors shows the increased electron density of the ring, leading to increased rates of electrophilic substitution^[6].



- Furan serves as a diene in Diels-Alder reactions with electron-deficient dienophiles such as ethyl (E)-3-nitroacrylate.^[7] The reaction product is a mixture of isomers with preference for the endo isomer:



- Hydrogenation of furans affords sequentially dihydrofurans and tetrahydrofurans.
- In the Achmatowicz reaction, furans converted to dihydropyran compounds.

Hazards	
Flash point	-35 °C
Related compounds	
Related heterocycles	Pyrrole Thiophene
Related compounds	Tetrahydrofuran (THF) 2,5-Dimethylfuran Benzofuran Dibenzofuran
✓ (what is this?) (verify) (http://en.wikipedia.org/w/index.php?title=Furan&diff=cur&oldid=390074448) Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	

See also

- Simple aromatic rings
- Furanose
- bs4994 Furan resin as thermoset FRP for chemical process plant equipments
- Furantetracarboxylic acid
- Furanoflavonoid

External links

- Recent synthetic methods (<http://www.organic-chemistry.org/synthesis/heterocycles/furans/furans.shtm>)

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