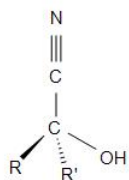


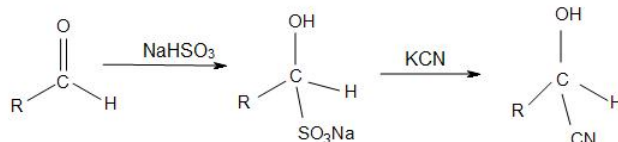
## 19.17: Nucleophilic Addition of –CN



Cyanohydrins have the structural formula of  $R_2C(OH)CN$ . The “R” on the formula represents an alkyl, aryl, or hydrogen. In order to form a cyanohydrin, a hydrogen cyanide adds reversibly to the carbonyl group of an organic compound thus forming a hydroxyalkanenitrile adducts (commonly known and called as cyanohydrins).

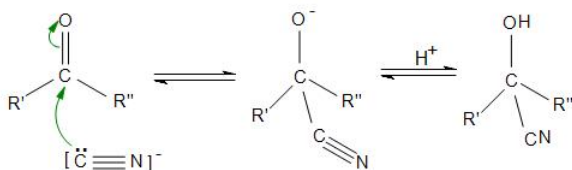
### Introduction

Cyanohydrin reactions occurs when an [aldehyde or ketone](#) gets treated by a cyanide anion (such as  $HCN$ ) or a nitrile forming a cyanohydrin product. This special reaction is a nucleophilic addition, where the nucleophilic  $CN^-$  attacks the electrophilic carbonyl carbon on the ketone, following a protonation by  $HCN$ , thereby the cyanide anion being regenerated. This reaction is also reversible.



Cyanohydrins are also intermediates for the [Strecker amino acid synthesis](#). The preparation of displacements of sulfite by cyanide salts are also followed under cyanohydrins.

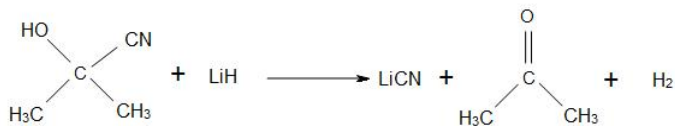
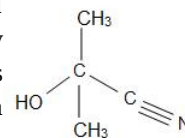
### Mechanism of Cyanohydrin Formation



Acid-catalysed hydrolysis of silylated cyanohydrins has recently been shown to give cyanohydrins instead of ketones; thus an efficient synthesis of cyanohydrins has been found which works with even highly hindered ketones.

### Acetone Cyanohydrins

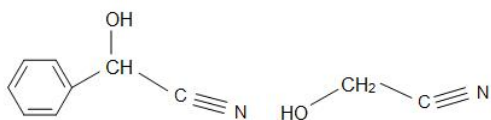
Acetone cyanohydrins (ACH) have the structural formula of  $(CH_3)_2C(OH)CN$ . It is an organic compound serves in the production of methyl methacrylate (also known as acrylic). It is classified as an extremely hazardous substance, since it rapidly decomposes when it's in contact with water. In ACH, sulfuric acid is treated to give the sulfate ester of the methacrylamid. Preparations of other cyanohydrins are also used from ACH: for HACN to [Michael acceptors](#) and for the formylation of arenas. The treatment with lithium hydride affords anhydrous lithium cyanide.



### Other Cyanohydrins

Other cyanohydrins, excluding acetone cyanohydrins, are: mandelonitrile and glycolonitrile.





Mandelonitrile has a structural formula of  $\text{C}_6\text{H}_5\text{CH}(\text{OH})\text{CN}$  and occurs in pits of some fruits. Glycolonitrile is an organic compound with the structural formula of  $\text{HOCH}_2\text{CN}$ , which is the simplest cyanohydrin that is derived by formaldehydes.

### Contributors

- Kathy Wong (UCD)

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