

(3) Hydrogen Cyanide, HCN
CAS No. 74-90-8
HS No. 28.11.19.90
TDG No. 1051 Class 6.1
Merck 4722

Synonyms: hydrocyanic acid, prussic acid, formonitrile

Physical Properties: MW: 27.03, mp: 13.24°C, bp: 25.70°C, d.0.7150. It is a colourless, low viscosity liquid with the odour of bitter almonds.

Synthesis: It has previously been prepared by the action of acid on sodium cyanide and the dehydration of formamide. There are two major commercial processes. The reaction of ammonia, methane (natural gas) and air using a platinum catalyst. This is the Andrussow process. The BMA process was developed by Degussa and involves the reaction of ammonia with methane. It can also be produced as a by-product in the manufacture of acrylonitrile by the ammoxidation of propylene (Sohio) where 15 kg HCN is produced for every 100 kg of acrylonitrile. The major commercial processes operate at a catalytic bed temperature of 1100°C and the major problem is the removal of excess heat since the products decompose above 400°C. Yields are of the order of 85%.

Reactivity: Hydrogen cyanide is a nitrile and so it hydrolyses to give formic acid and can be hydrogenated to methylamine. Aerial oxidation gives cyanic acid, HOCN and cyanogen [CN]₂. Chlorine reacts to form cyanogen chloride. It can add across CO and CC double bonds.

Toxicology: It is poisonous by inhalation, oral absorption and by skin absorption. The threshold limit value is 10 ppm, 100 ppm is dangerous for 30-60 minute exposure while 300 ppm is likely fatal. The LD₅₀ is less than 50 mg/kg. 2% HCN in air will cause poisoning in 3 minutes, oral absorption at 1 mg/kg can be fatal.

Uses: Estimates of the various uses of HCN in the USA are methyl methacrylate, 60%; cyanuric chloride, 15%; sodium cyanide, 10%; nitrilotriacetic acid and other chelates, 10%; others 5%. Herbicides based on cyanuric chloride showed the fastest growth.

Suppliers: The World Directory lists 24 manufacturers: USA (6), Japan (7), Belgium (1), France (1), Germany (4), UK (2), Italy (1), Netherlands (1) and Spain (1). The SRI International Directory lists 10 USA manufacturers with a total capacity of 1,534 million pounds most of which is processed further on-site.