

EXECUTIVE SUMMARY

- 0.1 The name Dicyandiamide (DCDA) was given to the dimer of cyanamide in 1862. The Dicyandiamide is an odorless, colorless, non-volatile powder with a monoclinic prismatic crystal structure. DCDA reacts with a variety of reagents. It is the simplest organic compound containing the C-N, C=N, and C=N groupings. Reaction may occur at one or more of these sites. DCDA is formed in almost quantitative yield by the dimerization of cyanamide in alkaline solution. The reaction occurs most readily at PH 8-10 by the addition of the anionic cyanamide species to the nitrile group. The product is a weaker acid than cyanamide, it is protonated immediately with the generation of a new cyanamide anion, which continues the process.
- 0.2 DCDA is being employed in a wide variety of applications. It is utilized as an intermediate for a number of resins and organic nitrogen compounds, such as guanamides, biguanides, and guanidine. Previously one of the major use of DCDA was in the conversion to melamine which itself finds a wide variety of applications in chemical industry.
- 0.3 But in recent years, the production of melamine based on DCDA route has decreased substantially and is now based on urea-route. DCDA reduces the viscosity of certain colloidal solutions. It is also being employed as a flame-retardant for cellulosic materials, wood & particularly shingles. DCDA powder is used as a curing agent for epoxy laminating resins, especially when a long pot life is necessary. DCDA can also be employed as a component in copolymers and co-condensates. It has also been employed as a preservative and several bactericidal, fungicidal, and insecticidal compositions have been developed. Other applications of DCDA is in the field of paper industry and as a latent curing agent in advanced aero space adhesives and composite resin systems.
- 0.4 Basic raw materials required for the manufacture of DCDA is cyanamide. Cyanamide is first prepared from calcium cyanamide by continuous carbonation in an aqueous medium at pH 7-8 and is then dimerized at pH 8-10. The manufacture of cyanamide and calcium cyanamide does not present any serious health hazard. However, ingestion of alcoholic beverages by workmen with in several hours of leaving the work place, some times causes a vasomotor reaction known as cyanamide flush, i.e., reddening of the face. But the product is essentially not toxic, but it may cause dermatitis.

- 0.F> DCDA is identified qualitatively by paper chromatography, and quantitatively by ultraviolet spectrometry of the chromatogram.
- 0.6 Dicyandiamide (DCDA) is not produced in India by any manufacturer. This speciality chemical is being imported from countries like U.S.A., China, Japan and Germany to meet the indigenous demand, which is estimated to be approx. 3,000 MT per annum. The largest producers are in Germany, Canada and Japan. In Canada DCDA is being manufactured by M/s. Cyanamid-Canada Inc. which manufactures calcium carbide and related products at its Niagra Falls facilities. This company which is a subsidiary of American Cyanamide Co. also produces cyanamide, and its derivatives. Cyanamide is occasionally marketed in North America in crystalline form, but primarily as a 50% solution. In Europe, cyanamide is available as a 50% solution and in crystalline form, from the Suddeutsche Kalkstick Stoffwerke, Trostberg Germany. There are still a high number of low cost producers which secure the shrinking demand of the world market. At present there is over capacity situation throughout the entire world in producing Dicyandiamide, and the present demand of DCDA is also shrinking which has lead to the general over capacity situation of the product throughout the entire world.
- 0.7 Demand for DCDA as an intermediate for a number of organic nitrogen compounds such as guanamides, biguanides, and guanidine salts still exists. The use of guanidine nitrate in defence sector, constitutes the main use of DCDA. A small market of DCDA to produce glues and adhesives which are used to an appreciable extent in the coating and sizing of paper, textiles, and in conditioning of phosphate drilling muds also exists.
- 0.8 Applications like flame-retardant for cellulosic materials and as a curing agent for epoxy laminates have also gained small market.
- 0.9 Presently, in India, no industrial unit is manufacturing DCDA, although few industrial units in India are engaged in manufacturing Guanidine derivatives but they are not utilizing DCDA at any stage in their process. In India the major users of DCDA are Textile Auxiliaries manufacturers, Defence, and I.D.P.L.

0.10 With a view to reduce / prevent the import of the product it would be appreciated that the product is manufactured in the country using Indigenous technology. Technology developed in India should be capable to produce Dicyandiamide at a cheaper rate as compared to the imported product. A break through has already been achieved at National Chemical Laboratory (NCL). Pune by establishing the technology to produce DCDA and its raw material calcium cyanamide on both Laboratory and Pilot plant scales. But so far no plant has yet been established based on the technology developed at NCL Pune. International R&D establishments have not informed about their R&D activities on Dicyandiamide and its products. Central Institute for Chemical Research, Institutional Central de chemic in Bucharest (Romania) has developed the experimental technology for obtaining Dicyandiamide, which operates as a pilot plant with an output capacity of 100 t/year.

0.11 RECOMMENDATIONS

The demand of the product in the world is shrinking. Moreover, leading manufactures of Dicyandiamide world wide are not interested to transfer technical know how. The demand in the country is met through import. It may be beneficial if the product could be manufactured in the country through indigenous technology which has been developed by NCL. This would obviate imports and may also be cheaper as compared to price of the imported product.