



Hexamine

1. INTRODUCTION

Hexamethylene Tetramine, more commonly known as Hexamine, has a wide range of applications for various industries. It is obtained by the reaction of formaldehyde and excess ammonia, either in an aqueous medium or in the vapor phase.

For energy reasons, the vapor-phase process is generally more preferred today. Here the two vapor flows of formaldehyde and ammonia are introduced to the hot reaction solution.

PT INTANWIJAYA INTERNASIONAL Tbk. uses continuous production system with vapor process technology to produce the purest Hexamine in the market today. Technology developed by West Germany.

2. APPEARANCE

Appearance	: White Crystals or Powder
Molecular Formula	: C ₆ H ₁₂ N ₄
Commercial Form	: Crystalline and coarse crystalline 99,55%

3. PHYSICAL AND CHEMICAL PROPERTIES

Contents	: 99.55%
Molecular Weight	: 140.19
Melting Point	: Sublimes at 280 °C
Ph-Value (10% Solution)	: 7.5-9.0
Density (20°C)	: 1.33g/cm ³
Solubility (in water)	: at 20°C 89,5g/100g at 40°C 87,4g/100g at 60°C 84,4 g/100g
Ignition temperature	: 390° C
Bulk density	: Crystalline form 700-800 kg/m ³

Ground form 300-400 kg/m³

Hexamine does not melt and sublimates almost under composed in a vacuum at 230-270°C. Decomposition begins at temperatures above 270°C. Hexamine is highly soluble in water. Solubility decreases slightly as temperature rises.

The solution are slightly alkaline, with pH values usually between 8 and 9. In organic solvents, Hexamine is barely soluble.

The following table shows the solubility of the pure product in a number of important solvents:

SOLVEN	Kg hexamine in 100 cm³ solvent
Chloroform	13.4
Methanol	7.2
Ethanol	2.9
Amyl alcohol	1.8
Acetone	0.6
Petroleum	0.2
Xylene	0.1
Trichloroethylene	0.1
Petroleum	
Ather	Insoluble

4. CHEMICAL PROPERTIES

Hexamine reactions can be divided into three groups:

- 4.1 Resembling a tertiaryamine :With many inorganic and organic acids, salts are formed as primary products.
- 4.2 Resembling formaldehyde :Hexamine hydrolyzes under the influence of heat, causing formaldehyde to split off ammonium salts to form. In many cases, it is advantageous that reaction is slower with Hexamine, than when using formaldehyde.
- 4.3 Other reaction :Hexamine forms additive or complex compounds with metal salt. Nitration produces cyclotrimethylene trinitramine, which is known by the names Hexogen, Cyclonite and RDX and uses as an explosive. Various amines are produced by reduction, such as monomethylamine and trimethylamine.

5. STORAGE BEHAVIOR & FLOW PROPERTIES

Hexamine is not hygroscopic. However, it is sensitive to humidity and absorbs moisture at a relative humidity above 65%, causing binding or clogging.

Pressure and warmth increase the likelihood of the product forming lumps. This effect is more pronounced with fine grained products.

Above all, this has a negative effect on the flow properties of the ground product. The product should therefore be best stored in a room with a constant temperature and a relative humidity below 60%. Likewise, there should be as little pressure on the product as possible (i.e. do not stack pallets on top of each other).



Apart from its tendency to stick, Hexamine is not subject to changes during storage and can be used even after several months. To improve the flow properties, particularly for the grades marked free flowing, special highly dispersed silica are added.

These additives are chemically neutral for those areas in which these grades are used. They are essential to enable the product to be used effectively. When conducting a test analysis of these grades, it should be remembered that the ash content is higher and the Hexamine content lower

When working with finely ground grades, precautionary measures must be taken against explosive dust/ air mixtures (e.by inaction through nitrogen and diversion of static electricity). Explosion pressure can reach 12.7 bar, with a maximum pressure build-up speed of 370 bar/sec.

6. PHYSIOLOGICAL PROPERTIES

Hexamine hydrolyzes in acid media and slowly releases formaldehyde. It has a very low toxicity and diluted solutions can be broken down biologically.

7. APPLICATIONS

In most areas of application, Hexamine can be regarded as a special form of formaldehyde. It has the advantage that no water is released during conversion, e.g. methylation reaction. The following is a brief description of the main areas of Hexamine application.

7.1 Plastics Industry

In a number of systems used in plastics manufacturing, the final hardened state is only achieved by adding a formaldehyde donor, which acts after a time delay.

Phenol formaldehyde resins (novalac) in particular, require Hexamine for hardening purposes.

7.2 Rubber Industry

There are two uses of Hexamine usually in the most finely ground form, as an auxiliary material in the manufacture of tires and technical rubber products

As a vulcanizing agent, Hexamine being a basic aldehydeamine is used as a secondary accelerator. Its main significance is as an activator of other accelerators (mercapto and sulfenamide product among others).

As an adhesion agent, Hexamine as a formaldehyde donor is mixed with resorcinol and silicic acid. The mixture is then directly added to the rubber-bonding compound.

It is vital that all three components are present, since they generate a synergistic effect. The strength of the bond achieved depends on the type of formaldehyde donor and the activity of the silicic acid used.

7.3 Explosives

In its nitrated form, Hexamine is a highly explosive material available under the names Hexogen, Cyclonite and RDX. It is often used in a mixture with TNT and with 3-5% wax added for stabilization.

7.4 Fuel Tablets

Fuel tablets that burn with a non-luminous flame and without smoke, leaving practically no residue, can be produced from Hexamine using mainly wax-like additives. The favorable burning property of Hexamine tablets is of particular interest to the armed forces. These high-energy non-toxin fuel tablets are also used by campers and other groups.

7.5 Urea Fertilizer

Hexamine is used as formaldehyde donor for coating the urea granules to improve the free-flowing.

7.6 Preservative & Anti-Microbial Effect

Hexamine is not a micro biocide by it self, but strongly antiseptic formaldehyde is split-off acid media. As such, it is used as a component in deodorants for external application.

7.7 Corrosion Inhibitor

Adding Hexamine to the pickling solution has proved effective in preventing iron and steel components corroding as far as this is possible during the pickling with mineral acids.

7.8 Textile Industry

Hexamine is used in combination with other products for crease resistant finishes. Further, it improves dyeing speed and acts as an activator for chlorite bleaching.

7.9 Foam Manufacturing

Among other products, the aerating agent diisotripropentamethylene tetramine is used in the manufacture of rubber and polyurethane sponges. This agent is manufactured from Hexamine and sodium nitrite in an aqueous solution of acetic acid. It is characterized by the extremely finely pored and uniform cell structure of the foam.

7.10 Chipboard Manufacturing

The glue used in the manufacture of chipboard is extracted by condensation by adding hardeners containing acid during the pressing procedure. The most popular hardener is ammonium chloride solution. The hardening solution is buffered with ammonia to prevent the hardening process commencing while the glue is still being applied.

Since it is slightly volatile, a suitable excess of ammonia must be used, which leads to pronounced odor. By adding Hexamine instead of ammonia, the undesirable release of ammonia fumes can be avoided, further, pot life is improved and a uniform hardening is achieved. This is particularly so in the core/ top layer zone.

7.11 Other Known Applications

Hexamine is used in small quantities as a stabilizer for polyvinyl acetate, an acid deactivator with herbicide formulations, in solvent extraction of phenol during tar and oil processing, in the synthesis of glycine, among others.

SAFETY PRECAUTIONS

Discomfort or health risks may affect some humans when handling Hexamine, in the form of sensitization of the skin after contact with the product. Skin contact with the product in dust form can cause allergic reactions such as simple irritation, reddening and blistering of the skin.

However, skin problems heal quickly when exposure to the product is stopped. In cases of allergic reaction, a physician should be consulted if possible. Allergic persons cannot be employed in areas where Hexamine is handled or used.

Protective gloves should be worn to avoid direct contact with the product. Dust masks should be worn to protect against the irritant effects of dust. It is further recommended that the body and clothing be thoroughly cleaned after working with the product and a protective skin ointment be applied.

PACKAGING AND SHIPPING INFORMATION.

25 Kg	Packed in woven polypropylene bags (WPP bag) or paper bag with double inner polyethylene liner, heat seal.
18 MT	20 FT Container



HEXAMINE



HEXAMINE 99.5%

六甲基四胺

NET
25 Kg

MANUFACTURED BY
INTAN WIJAYA CHEMICAL INDUSTRIES
BANJARMASIN INDONESIA

HEXAMINE