3M

Product Information

Dynamar™ Curative HX-868

Description

This material is a trifunctional aziridine amide derived from trimesic acid and butylene imine.

Suggested Use

Dynamar HX-868 belongs to the chemical class of acyl aziridines which react with carboxylic acids to form ring-opened ester-amide linkages and with alcohols in the presence of acidic catalysts to form ring-opened ether-esters. These reactions take place at relatively low temperatures and without the evolution of byproducts, so HX-868 can be used as a chain extender or crosslinker to cure carboxyl-functional polymers or to harden hydroxyl-functional polymers in the presence of acidic species.

HX-868 has found use in solid rocket propellant formulations where it acts as a curative for carboxyl-functional binder polymers. The aziridine amide groups of the HX-868 react with the carboxyl groups of the polymer to convert the liquid suspension of fuel and oxidizer particles into an elastomeric solid.

Another application for HX-868 has been in the liner formulations for polyurethane-crosslinked propellants which use ammonium perchlorate as an oxidizer. The loss of isocyanate from the propellant into the liner during cure leaves a weak layer in the propellant at the liner interface, but if HX-868 is incorporated into the liner it diffuses into the propellant and helps to crosslink the binder, restoring the appropriate mechanical properties and improving the propellant-to-liner bond.

Typical Properties

Not for specification purposes

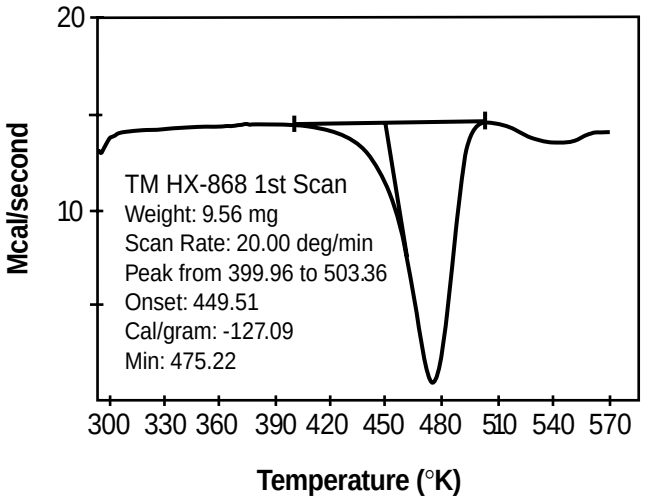
All measurements at 25°C, 1 atm unless noted

Appearance	Colored, viscous liquid which may gradually solidify during long storage. Colors may vary from yellowish through red or green to brown.
Viscosity, cps	100,000
Density, g/cc	1.11
Equivalent weight (KSCN Titration)	141
Moisture, %	0.03
Flash point (Penske-Martens Closed Cup)	>110°C (230°F)

Caution

Hazardous polymerization may occur if a mass of this product is heated about 55°C (130°F). A differential scanning calorimeter was used to examine the exothermic behavior of HX-752. When a small sample was heated at a rate of 20°C per minute, it showed an exothermic reaction peaking near 190°C (374°F) amounting to a heat release of 121 calories per gram. The trace is reproduced below. If exothermic polymerization occurs because of overheating, do not breathe the smoke or fumes that may be generated.

Differential Scanning Calorimetry Results for HX-868 Showing Exothermic Behavior



Handling

Dynamar™ HX-868 becomes a brittle, glassy material at the recommended storage temperature, but may crystallize slowly over a long period of time. The crystallization is faster at higher temperatures, and thermal cycling seems to promote it. Solidification does not affect the quality or activity of the product.

HX-868 may be warmed to 43°C (about 110°F) to melt the crystallites and lower the viscosity for easier handling. The safest way to avoid polymerization is to immerse the container in a water bath at 43°C. If the container is kept closed until it is warm, moisture condensation in the product will be avoided.

A small sample of each lot of HX-868 is tested at 3M by holding it for 16 hours at 43°C and then retesting the equivalent weight by KSCN titration. The result must remain essentially unchanged if the lot is to be released. This equivalent weight determination is the most sensitive measure of the quality of the product and should be retested if there is any concern about changes in the product due to long storage, freezer malfunction or suspected mishandling.

If HX-868 is being used in quantities of less than a full container, it is recommended that the original container be warmed to no higher than 43°C and all the material repackaged into containers in which each hold the amount required for a single batch. This ensures that the material in the original container will not be repeatedly warmed each time a small amount is needed. The containers should be metal cans or plastic bottles (polyethylene is suitable) because upon crystallization in glass bottles HX-868 sometimes cracks the bottles. Sturdy plastic bags (with a zipper seal) may also be suitable if the HX-868 has not been compounded with a plasticizer.

Safety and Toxicology	Material Safety Data Sheets are available from 3M Performance Materials Division.
Storage	The recommended storage temperature for HX-868 is -18°C (0°F), and at this temperature the shelf life is at least two years. At higher temperatures HX-868 is generally found to rearrange to the oxazoline form or slowly homopolymerize.
Shelf Life	Two years under recommended storage conditions.
Packaging	One-pound, eight-pound and 44-pound units.
Shipping	To ensure stability during transit, all shipments of this product are made in insulated cartons packed with dry ice.

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