

technical bulletin

High Purity Dimethylhydrazine

Unsym-Dimethylhydrazine [1,1-Dimethylhydrazine]

Molecular Formula	Me ₂ NNH ₂
CAS Number	57-14-7
Molecular Weight	60 g/mol
Density	0.791
Melting Point	-58°C
Boiling Point	63°C
Vapor Pressure Equation	Log P (mmHg) = 8.19 - 1780/T (K)
[See Figure 1]	

Unsym-dimethylhydrazine (DMHz) has been used widely to grow GaN and GaPN alloys. The GaN films with excellent morphology were obtained with FWHM as narrow as 147 arcsec. More recently, this precursor has gained acceptance as the optimum source for MOVPE of InGaAsN.

Figure 1: Vapor Pressure Curve
1,1-Dimethylhydrazine

To ensure the highest purity, SAFC Hitech has developed a purification process and analytical methods to produce EpiPure™ DMHz. The novel process focuses on the removal of water contaminants as moisture is the main impurity in this product

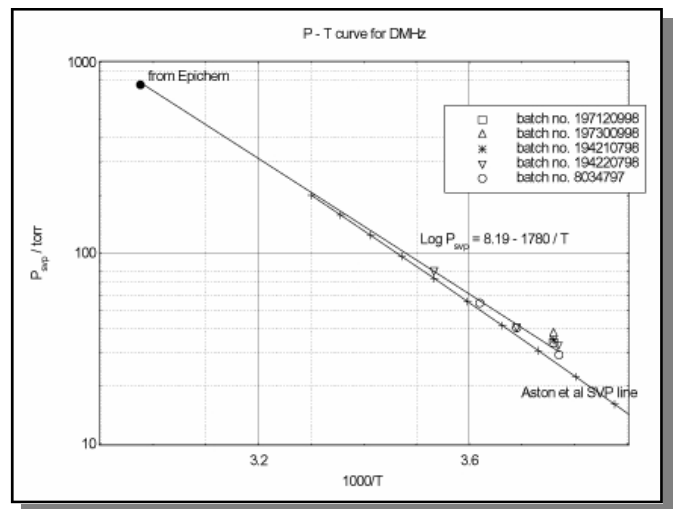


Figure 1

Our purification process involves chemical and physical purification steps that give very high purity DMHz. The moisture level was initially quantified by FTNMR spectroscopy where FWHM of the NH₂ peak became narrower with reduced water content (Figure 2).

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Figure 2: 200 MHz ¹H NMR spectrum comparison of crude and purified 1,1-dimethylhydrazine.

In very pure samples, the original NMR spectroscopy technique was not found to be sufficiently sensitive and therefore, GC-AED, a sophisticated in-house technique, was investigated to obtain quantitative values.

The machine was calibrated using 1,4 dioxan spiked with known quantities of water (Figure 3), and the results obtained were used to calculate the levels of water present in the different samples of 1,1-dimethylhydrazine.

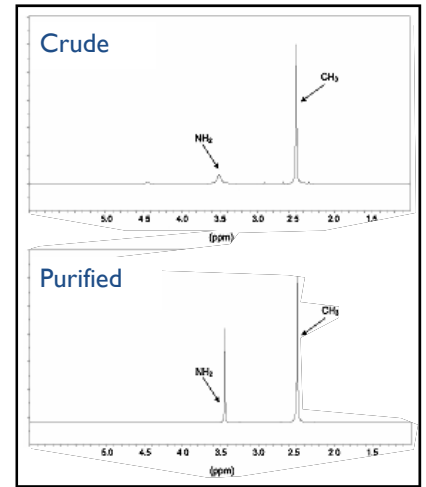


Figure 2

Figure 3: Graph of hydrogen counts against ppm of water added to obtain a calibration curve.

From the graph, it was possible to calculate and correlate ppm levels of water in the purified material to FWHM of the NH₂ peak in the ¹H NMR spectra.

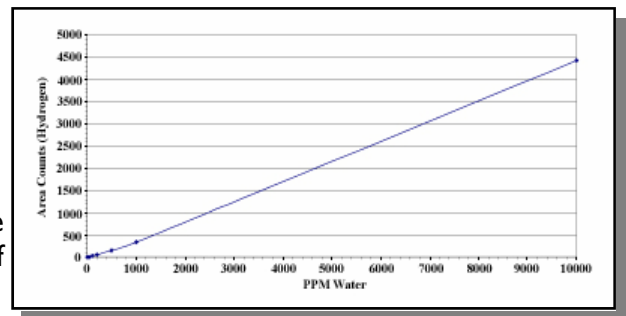


Figure 3

Another analysis technique used to assess purified DMHz was Cryogenic Mass Spectrometry. The m/e peaks at 60 and 18 amu corresponded to the parent ions for DMHz and water respectively, and the ratio of the peaks was used as a measure of water levels present in the samples.

Correlation of these characterisation approaches has allowed a significantly more sensitive NMR methodology to be installed such that ppm levels of moisture in the final product can be detected.

The final quality check for DMHz was MOCVD of GaAsN lasers with emission at 1.18µm. The resulting devices possessed extremely low current densities highlighting ultra high purity EpiPure™ DMHz is exceptionally well suited as a high purity N source for a wide range of material systems.

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