

Certificate of Analysis

Piperazine

PurCert Standard for GC

(Secondary Reference Standard)

Product Number	PSR42708	CAS No.	110-85-0
Brand	PureSynth	Lot No.	P42708T0823
Molecular Formula	C ₄ H ₁₀ N ₂	Date of Mfg.	August.2023
Molecular Weight	86.14 g/mol	Date of Exp.	July.2027

Test	Specification	Result
Description	White Crystals	White Crystals
Assay (GC-FID)	≥ 99.5 %	99.93 %
Water (By KF)	NMT 0.6000 %	0.5250 %
Identification by ¹ H NMR	Conforms to structure	Conforms
Identification by GC-MS	Conforms to molecular mass	Conforms
Identification by IR	Conforms to structure	Conforms

***Traceable to USP Reference Standard 1541601 Lot no: R158C0.**

Storage Condition: Store at room temperature and keep the container tightly closed.

Remark: The batch complies with the prescribed quality of the above specification.

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Assay by GC-FID

METHOD: GC- FID conditions:

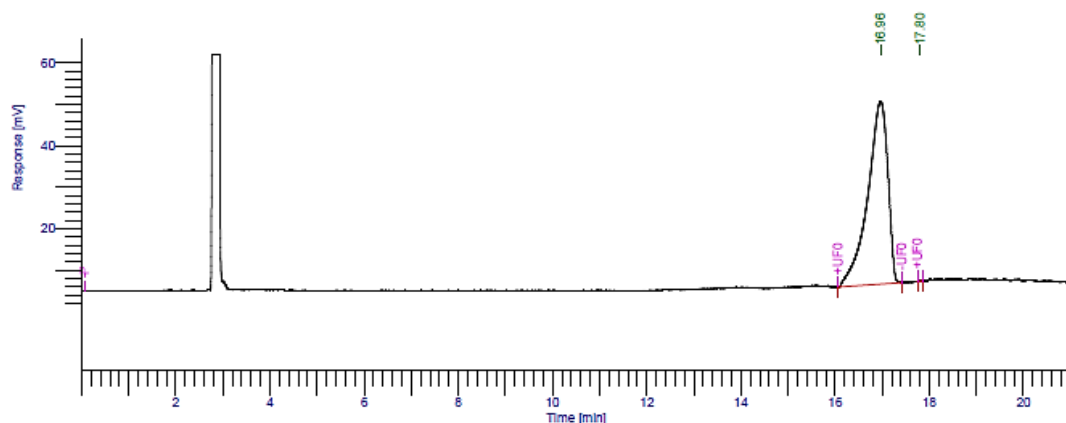
Column: Agilent Technologies DB-FFAP 30mx 0.530mm, 1.0micron

Instrument: PerkinElmer, GC 2014,

Detector: FID, **Carrier gas:** Nitrogen

Temp programming: Initial 50°C hold for 1min, 5°C Ramp/ min., 100 °C hold for 1 min., 25°C Ramp up to 250°C hold for 2 min., Run time 20 min.

Software Version	: 6.3.4.0700	Date	: 23-11-2023 13:21:41
Operator	: manager	Sample Name	: PIPERAZINE-P42708T0823
Sample Number	: 001	Study	:
AutoSampler	: BUILT-IN	Rack/Vial	: 0/27
Instrument Name	: Clarus 690	Channel	: A
Instrument Serial #	: 690S23050206	A/D mV Range	: 1000
Delay Time	: 0.00 min	End Time	: 21.00 min
Sampling Rate	: 12.5000 pts/s		
Sample Volume	: 1.000000 ul	Area Reject	: 0.000000
Sample Amount	: 1.0000	Dilution Factor	: 1.00
Data Acquisition Time	: 23-11-2023 11:55:51	Cycle	: 1



GC Reports

Peak #	Component Name	Time [min]	Area [uV*sec]	Height [uV]	Area [%]
1		16.964	1306247.44	44091.22	99.93
2		17.803	875.81	269.08	0.07
			1307123.25	44360.31	100.00

Missing Component Report
Component Expected Retention (Calibration File)

All components were found

Purity by GC-FID: 99.93 %

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IDENTIFICATION TESTS

GC-MS Spectrum:

METHOD: GC-MS conditions:

Column: Agilent Technologies, Elite -5MS, 30 m X 0.25 mm, 1.0micron

Instrument: Perkin Elmer, **Carrier gas:** Helium

Source Temp.: 230°C, Transfer line: 250°C

Inlet Temp.: 180°C, **Diluent:** Methanol

Source energy: 70eV

Mass by GC-MS:

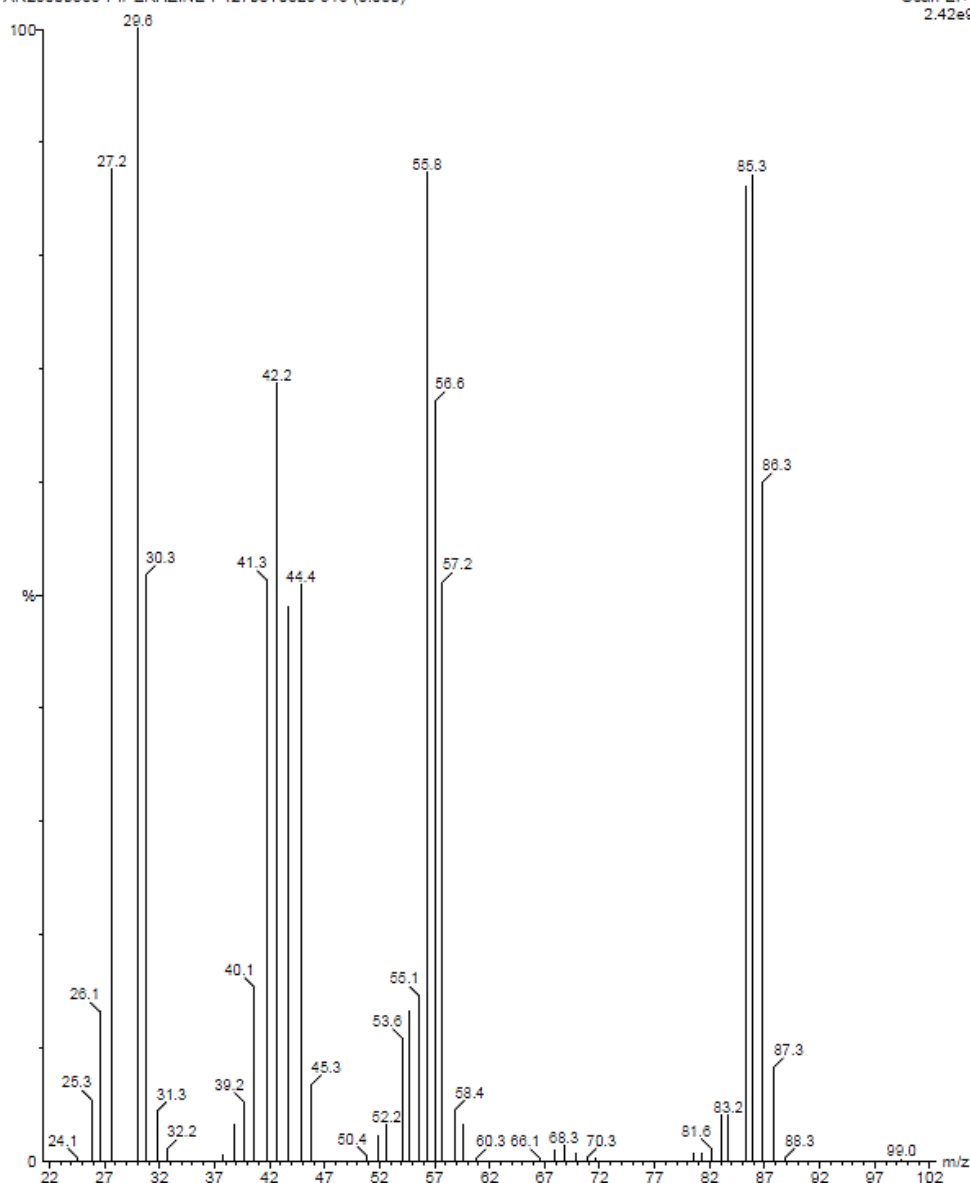
Product Name: Piperazine

Product Code: PSR42708

, 23-Nov-2023 + 11:25:20

AR23000585-PIPERAZINE-P42708T0823 916 (8.080)

Scan El+
2.42e9



Identification by GC-MS: Conforms to molecular mass

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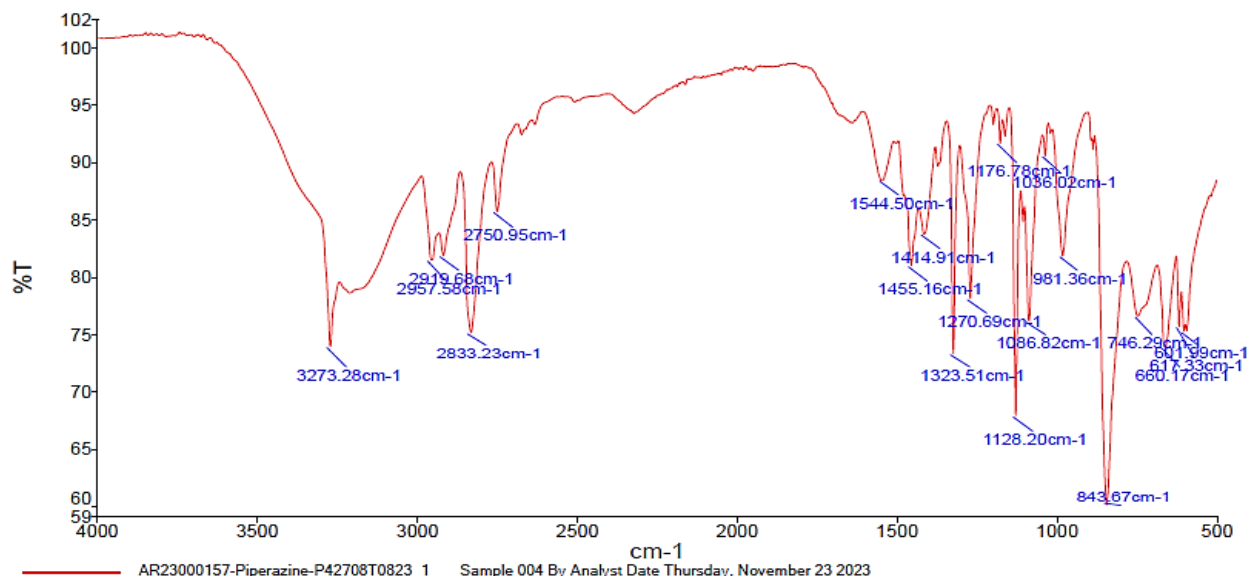
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Infrared spectrum:

Product Name: Piperazine

Product Code: PSR42708

Analyst
Date



Source Spectra Results		
Spectrum Name		Number Of Peaks
AR23000157-Piperazine-P42708T0823_1		20
List of Peak Area/Height		
Peak Number	X (cm-1)	Y (%T)
1	3273.28	73.98
2	2957.58	81.51
3	2919.68	81.90
4	2833.23	75.17
5	2750.95	85.74
6	1544.50	88.48
7	1455.16	81.04
8	1414.91	83.80
9	1323.51	73.34
10	1270.69	78.15
11	1176.78	91.71
12	1128.20	67.93
13	1086.82	76.18
14	1036.02	90.63
15	981.36	81.88
16	843.67	60.13
17	746.29	76.64
18	660.17	73.84
19	617.33	75.72
20	601.99	75.29

Identification by IR: Conforms to structure

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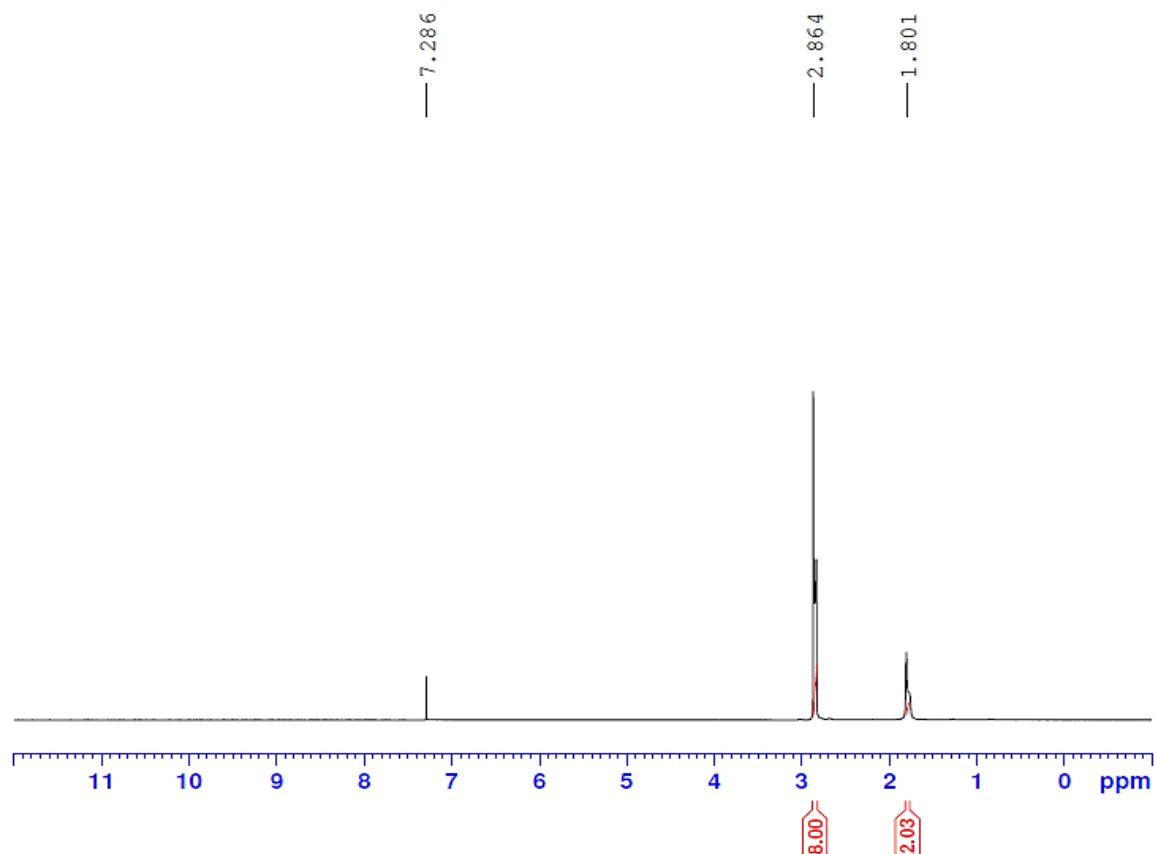
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¹H NMR Spectrum:

Product Name: Piperazine

Product Code: PSR42708

Piperazine
B.no-P42708T0823
1H-NMR in CDCL₃



Identification by ¹H NMR: Conforms to structure

Maximum limits of impurities

WATER DETERMINATION

Method: Karl Fisher titration

Water Content (PSR42708) = **0.5250 %**

Approved By
Head - Technical

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