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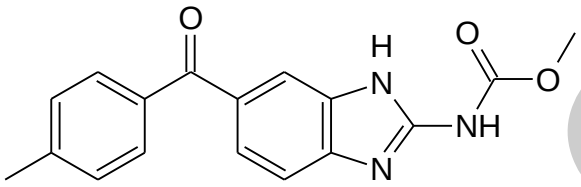
Reference Material Product Information Sheet

Epichem's Quality System conforms to ISO9001:2015 as certified by ECAAS Pty Ltd - Certification number 616061.



Name	(5-(4-methylbenzoyl)-1*H*-benzimidazol-2-yl)-carbamic acid methyl ester
Synonym(s)	methyl (5-(4-methylbenzoyl)-1*H*-benzimidazol-2-yl)carbamate
BP Name	Mebendazole Impurity F
Epichem Item #	EPL-AA252 Batch 1
CAS #	31545-31-0
Molecular Formula	$C_{17}H_{15}N_3O_3$
Molecular Weight	309.33 g/mol
Appearance	Cream powder
Melting Point	293.0-303.4°C (decomposition)
Combustion Analysis	Required (%): C: 66.0, H: 4.9, N: 13.6. Found (%): C: 66.1, H: 4.7, N: 13.6.
Purity*	99.0%
Date of Manufacture	15 August 2019
Storage Requirements	Protect from heat, light and moisture.
Special Precautions	**This compound is for laboratory use only. Its toxicological properties may not have been fully established. It should be handled only by suitably qualified personnel.**
Intended Use	This compound is suitable for the identification of impurities and degradants in pharmaceutical materials. The purity assay is considered as relative contribution.
Date of Shipment	TBA
	This certificate is valid for one year from the date of shipment provided the substance is unopened and stored under the recommended conditions.
Retest Date	TBA (Proper Storage and Handling Required)

** NATA accreditation does not cover the performance of this service*

Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

I. Identity

The identity of this product was established using the following analyses:

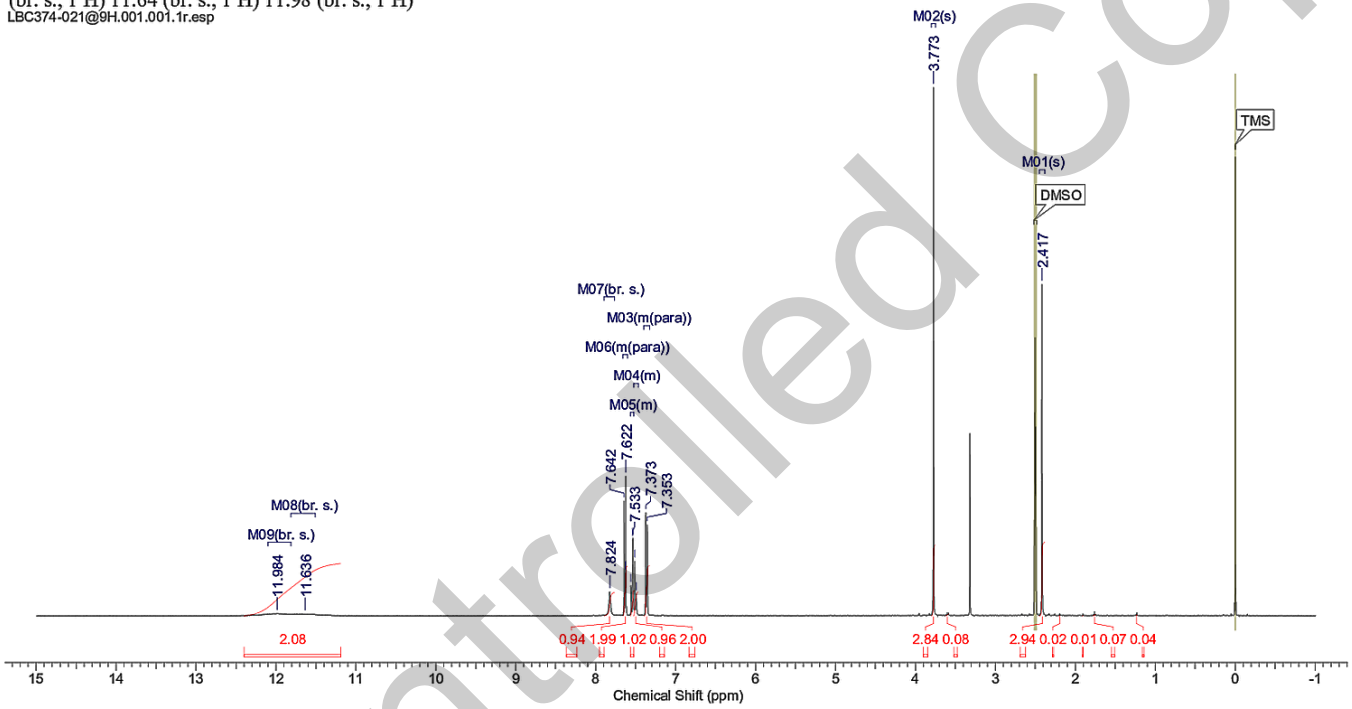
Ia. [1]HNMR Spectrum

Conditions: 400 MHz, DMSO-d_6

[1]HNMR spectrum consistent with chemical structure.

Acquisition Time (sec)	3.7547	*Comment*	LBC374-021@9H 1H DMSO {E:\dataexternal\epichem} cygoh 6	*Date*	13 Aug 2019 17:27:28		
Date Stamp	13 Aug 2019 17:27:28			*File Name*	\\naphthalene\company\NMR files\LBC374\LBC374-021@9H\1\pdata\1\1r		
Frequency (MHz)	400.13	*Nucleus*	1H	*Number of Transients*	8	*Origin*	spect
Original Points Count	24038	*Owner*	nmr	*Points Count*	1048576	*Pulse Sequence*	zg
Receiver Gain	203.00	*SW(cyclical) (Hz)*	6402.05	*Solvent*	DMSO-d6	*Spectrum Offset (Hz)*	2798.5842
Spectrum Type	STANDARD	*Sweep Width (Hz)*	6402.04	*Temperature (degree C)*	24.996		

^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.42 (s, 3 H) 3.77 (s, 3 H) 7.36 (m, *J*=7.83 Hz, 2 H) 7.47 - 7.52 (m, 1 H) 7.52 - 7.56 (m, 1 H) 7.60 - 7.66 (m, 2 H) 7.82 (br. s., 1 H) 11.64 (br. s., 1 H) 11.98 (br. s., 1 H)



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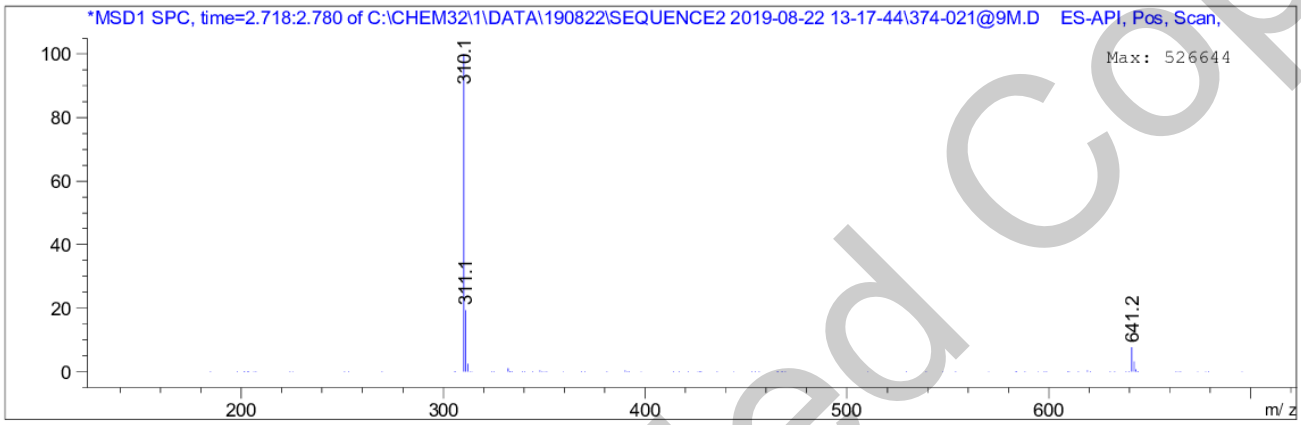
Ib. Mass Spectrum

The mass spectrum of this material was analysed by Liquid Chromatography Mass Spectroscopy (LCMS) using in-house EM005.WI08.

Method: ACN/water gradient (+0.1% formic acid)

ZORBAX SB-C8, 4.6 x 30 mm, 3.5 micron

Retention Time (MS)	MS Area	Mol. Weight or Ion
2.745	4294675	311.15 I
		310.10 I



Theoretical value: 310.1 $[M+H]^+$

The signal of the Mass Spectrum is consistent with the theoretical value and its interpretation is consistent with the structural formula.

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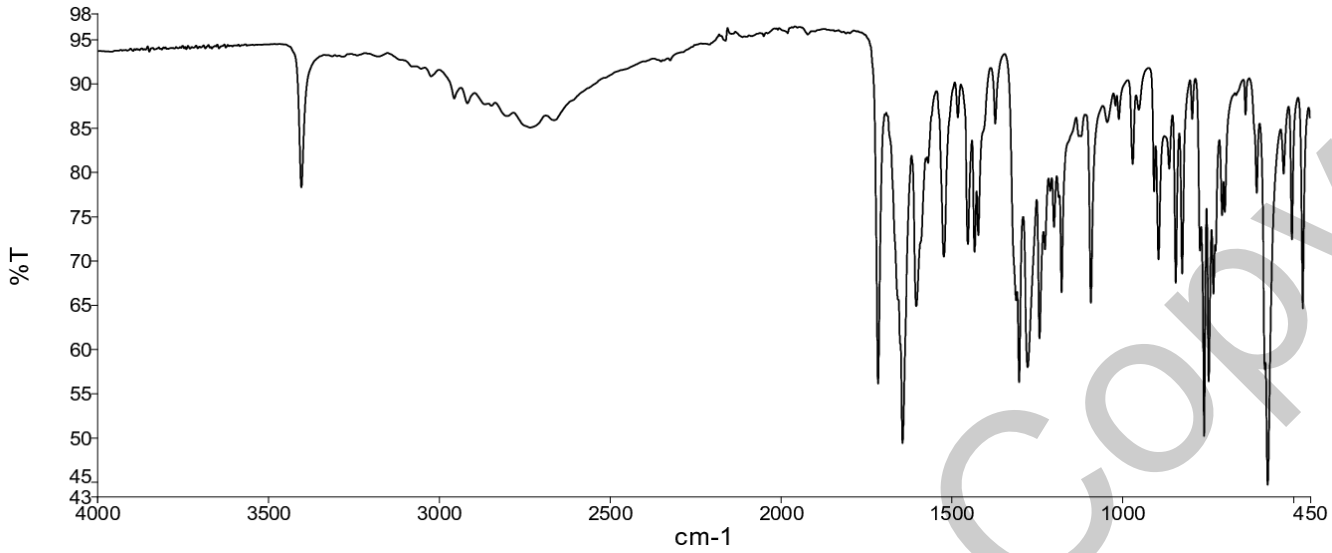
Ic. IR Spectrum

The infra-red spectrum of this material was analysed by Fourier-Transform Infra-red Spectroscopy (FTIR) using in-house EM005.WI09.



The interpretation of the signals of the Fourier Transform Infra-red Spectrum is consistent with the structural formula.

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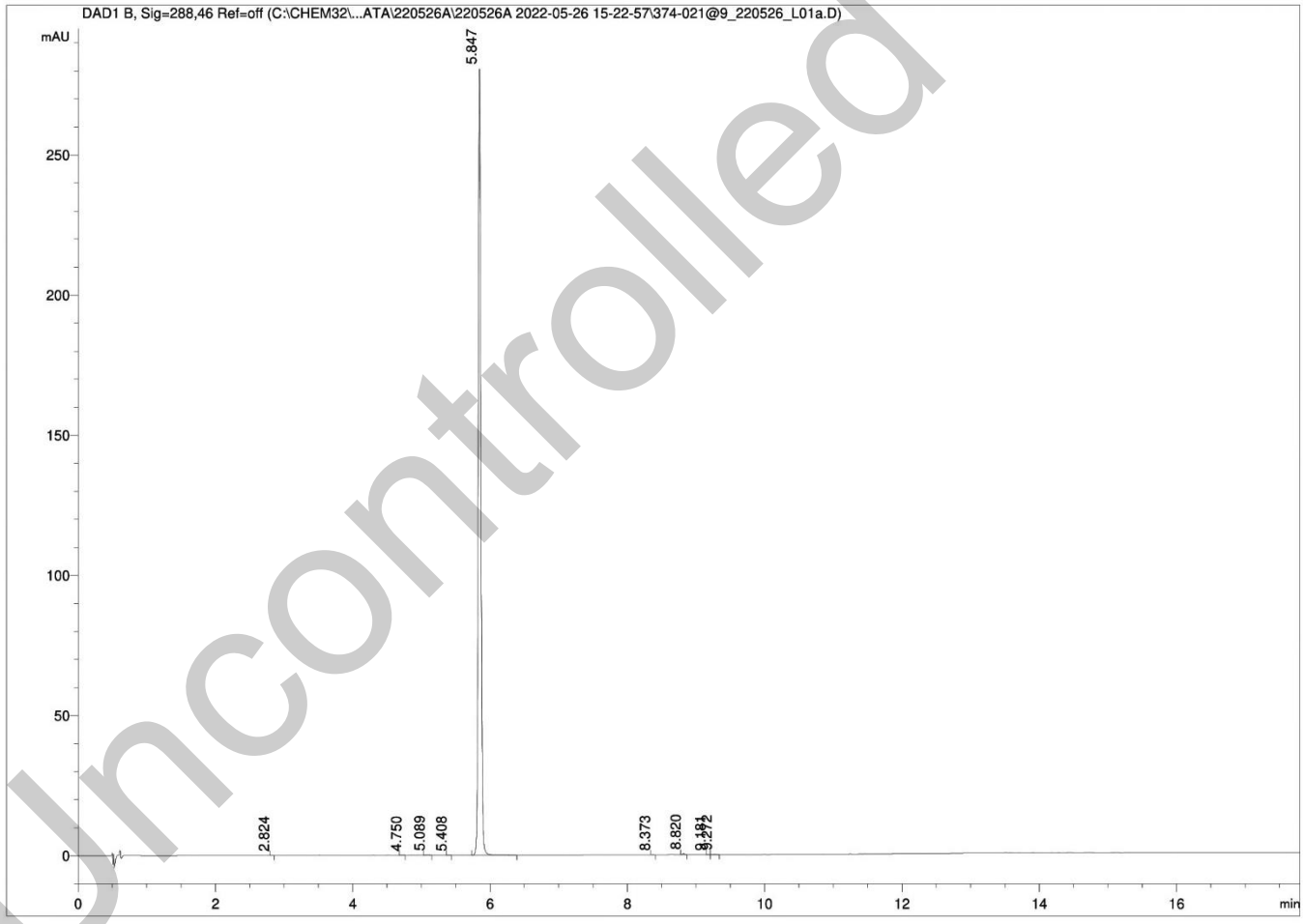
II. Purity

The purity of this material was analysed by high performance liquid chromatography (HPLC) using in-house EM005.WI07.

HPLC Conditions:

Column	Conditions				Detector	Injector
Agilent Poroshell 120 EC-C18 4.6 x 50mm 2.7 micron	25ºC				DAD 288nm	Auto 1.0 µL 0.20mg/mL in 50% acetonitrile 50% dimethylsufoxide (NO MODIFIERS)
	Time (min)	% Line A (Water + 0.1% (v/v) TFA)	% Line B (Acetonitrile + 0.1% (v/v) TFA)	Flow rate (mL/min)		
	0.00	85	15	1.0		
	6.00	61	39	1.0		
	11.60	5	95	1.0		
	16.60	5	95	1.0		
	17.60	85	15	1.0		
	20.60	85	15	1.0		



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Area Percent Report – Sorted by Signal

Peak Number	Retention Time (rounded)	Area	Area % (rounded)
1	2.82	0.04	0.00
2	4.75	0.05	0.01
3	5.09	0.37	0.05
4	5.41	0.05	0.01
5	5.85	752.37	99.77
6	8.37	0.14	0.02
7	8.82	0.71	0.09
8	9.18	0.03	0.00
9	9.27	0.32	0.04
Totals			100 (rounded)

For the calculation the system peaks were ignored. The content of the analyte was determined as a ratio of the peak area of the analyte and the cumulative areas of the purities, added up to 100%.

Results:

Average 99.8% (average of 10 duplicate analyses)

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III. Water Content

Method: Karl-Fischer titration using in-house EM005.WI04.

Results:

Average 0.2%

IV. Ash Content

Method: BP 2019 Ash Appendix XIJ Method II

Result:

Contains 0.2% ash.

V. Residual Solvents

Method: ^{1}HNMR

Result:

Contains 0.4wt% tetrahydrofuran and other trace unidentified impurities by ^{1}H NMR analysis.

VI. Final Result

Chromatographic purity (HPLC)	99.8%
Water content	0.2%
Ash content	0.2%
Residual solvents	0.4%
Purity*	99.0%

This purity is assessed to be 99.0%

Product Reviewed By:

James Rixson, PhD
Head of Production

Product Released By:

Jason Chaplin
Principal Chemist

Release Date: 2 June 2022

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The calculation of the purity follows the formula:

$$\text{Purity}(\%) = \frac{((\text{Chromatographicpurity[HPLC]})x(100 - (\text{watercontent} + \text{ashcontent} + \text{volatilecontents})))}{100}$$

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