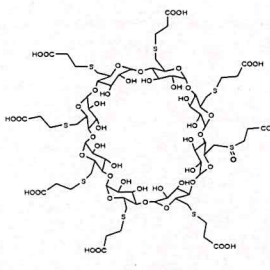




SPINCOTECH PVT LTD, R&D Centre
 Shed No.B-21, SIDCO Pharmaceutical complex
 Alathur, Thiruporur, Chennai - 603 110
 Ph: 044-27444415; Mobile: 9384833003
 E-mail: info@spincosynthesis.com
 Web: www.spincosynthesis.com

CERTIFICATE OF ANALYSIS

Page 1 of 1

NAME OF THE PRODUCT/ IMPURITY (IUPAC Name)	SUGAMMADEX SULFOXIDE DIASTEREOMER-2 IMPURITY IUPAC NAME: 6-Deoxy-6-((2-carboxyethyl)sulfinyl)-heptakis(6-deoxy-6-(2-carboxyethyl)thio)-gamma-cyclodextrin Epimer B	
CAS. No.	: 2412953-12-7	STRUCTURE  $C_{72}H_{112}O_{48}S_8$ Exact Mass: 2016.4
BATCH No.	: SRD054/SUG-IMP2-II/026/0622	
MFG. DATE	: JUN-2022	
AR No.	: SRD054/SUG-IMP2-II/026/0622/AR23-3850	
DATE OF ANALYSIS	: 20 JUN 2023	
RETEST DATE	: 19 JUN 2024	
GRADE	: IN-HOUSE	
BATCH QUANTITY	: -10mg	

S. No.	TESTS	SPECIFICATIONS	RESULTS
1	Description	Report the result	White solid
2	Identification by MS	The exact mass of Sugammadex sulfoxide diastereomer-2 impurity should be confirmed as 2016Da	Mass spectral data confirms the exact mass of Sugammadex sulfoxide diastereomer-2 impurity as 2016Da
3	Identification by 1H & ^{13}C NMR	The molecular structure of Sugammadex sulfoxide diastereomer-2 impurity should be confirmed by 1H & ^{13}C NMR spectra	1H & ^{13}C NMR spectra confirms the molecular structure of Sugammadex sulfoxide diastereomer-2 impurity
4	Purity by HPLC	For Informative	96.76% Area
5	Volatile loss by TGA	For Informative	0.64% w/w
6	Potency	For Informative	96.12% w/w

Storage condition: (i) For long term: Storage at 2 to 8°C.
 (ii) For transport: Ambient temperature.

Remarks: The product **conforms** / **does not conform** to the above specification.

Prepared By (Sign& Date)	<i>Gokul</i> 21 Jun 23	Reviewed By (Sign& Date)	<i>L. K. Manohar</i> 21 Jun 2023	Approved By (Sign& Date)	<i>Manohar</i> 21 Jun 23
-----------------------------	---------------------------	-----------------------------	-------------------------------------	-----------------------------	-----------------------------

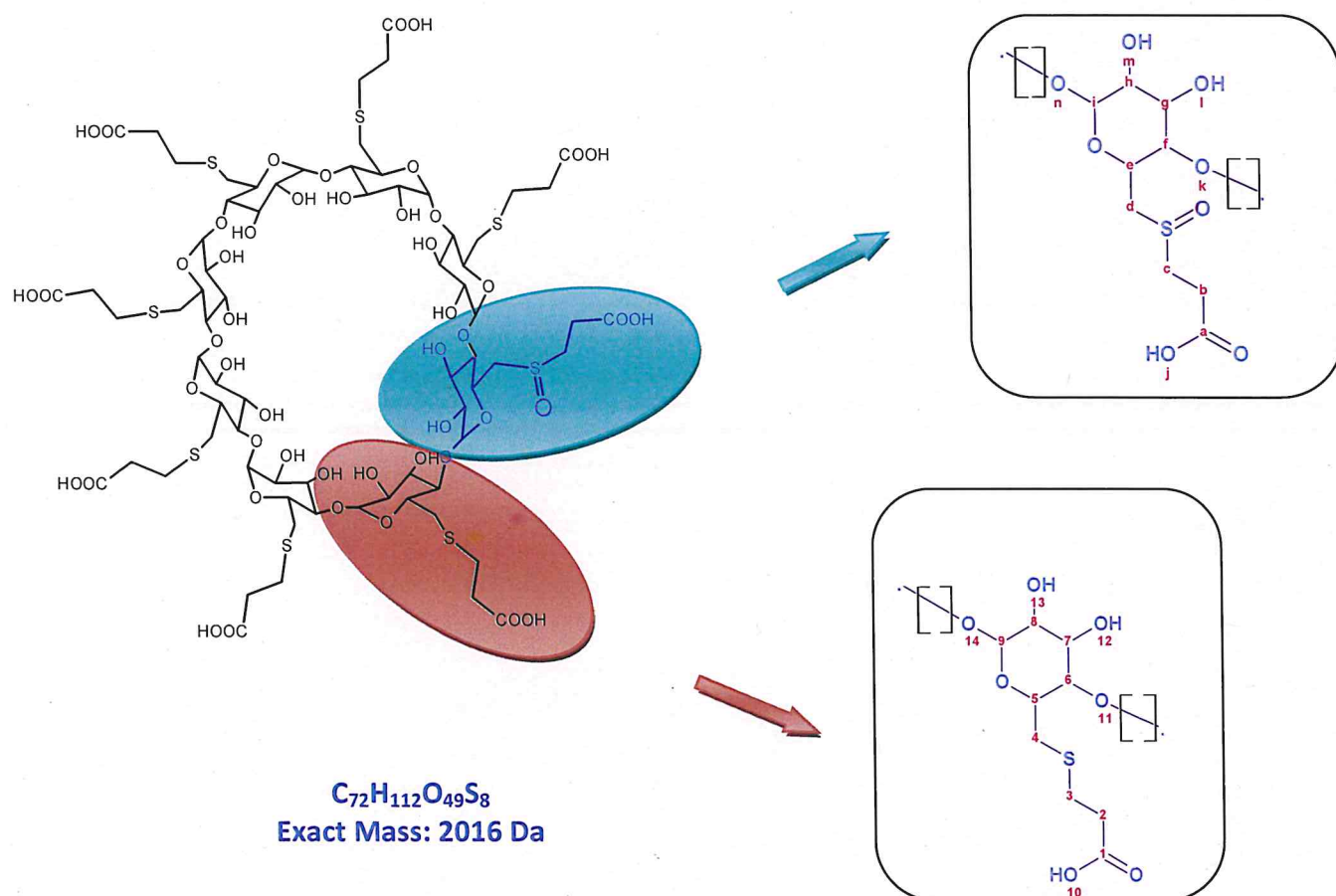
^1H & ^{13}C NMR Spectral data

Conditions: 200MHz, DMSO- d_6 (^1H NMR)

Conditions: 500MHz, DMSO- d_6 (^{13}C NMR)

The structure of Sugammadex sulfoxide diastereomer-2 impurity (SRD054/SUG-IMP2-II/026/0622) is confirmed with the signals of the ^1H & ^{13}C spectra and their respective interpretation

Sugammadex sulfoxide diastereomer -2 impurity



Spincotech
21/5/2023

21/5/2023

The assignment of ^1H and ^{13}C NMR signals of Sugammadex sulfoxide diastereomer-2 impurity

Position ^a	^1H	^1H δ (ppm)	Multiplicity ^b	^{13}C δ (ppm)	^{13}C	Position ^a	^1H	^1H δ (ppm)	Multiplicity ^b	^{13}C δ (ppm)	^{13}C
1	--	--	--	173.531	C	a	--	--	--	173.022	COOH
2 ^c	14H	2.348-2.500	m	33.596	CH ₂	b	2H	2.599-2.633	d	28.287	CH ₂
3	14H	2.705-2.771	t	28.287	CH ₂	c	2H	2.845	m	47.725	CH ₂
4	14H	2.932-3.087	m	34.973	CH ₂	d	2H	3.133	m	51.933	CH ₂
5	7H	3.447	m	73.070	CH	e	1H	3.497	m	73.070	CH
6	7H	3.782	m	71.676	CH	f	1H	3.922-4.025	t	65.685	CH
7	7H	3.550-3.595	t	72.749	CH	g	1H	3.638	m	72.749	CH
8	7H	3.305	m	84.476	CH	h	1H	3.497	m	83.780	CH
9	7H	4.916	sb	102.541	CH	i	1H	4.956-4.971	d	101.541	CH
10 ^d	7H	--	--	--	CO-OH	j	1H	--	--	--	CO-OH
11	--	--	--	--	--	k	--	--	--	--	--
12	7H	5.927	sb	--	OH	l	1H	5.927	sb	--	OH
13	7H	5.927	sb	--	OH	m	1H	5.927	sb	--	OH
14	--	--	--	--	--	n	--	--	--	--	--

^a Carbon and Hydrogen numbering - only for NMR spectral data assignments,

^b Resonance multiplicities, coupling constants, and coupled partners in parentheses: (s) singlet, (t) triplet, (m) multiplet, (sb) singlet broad, (d) Doublet.

^c At 2nd position of CH₂ protons overlapped with NMR solvent DMSO-d₆,

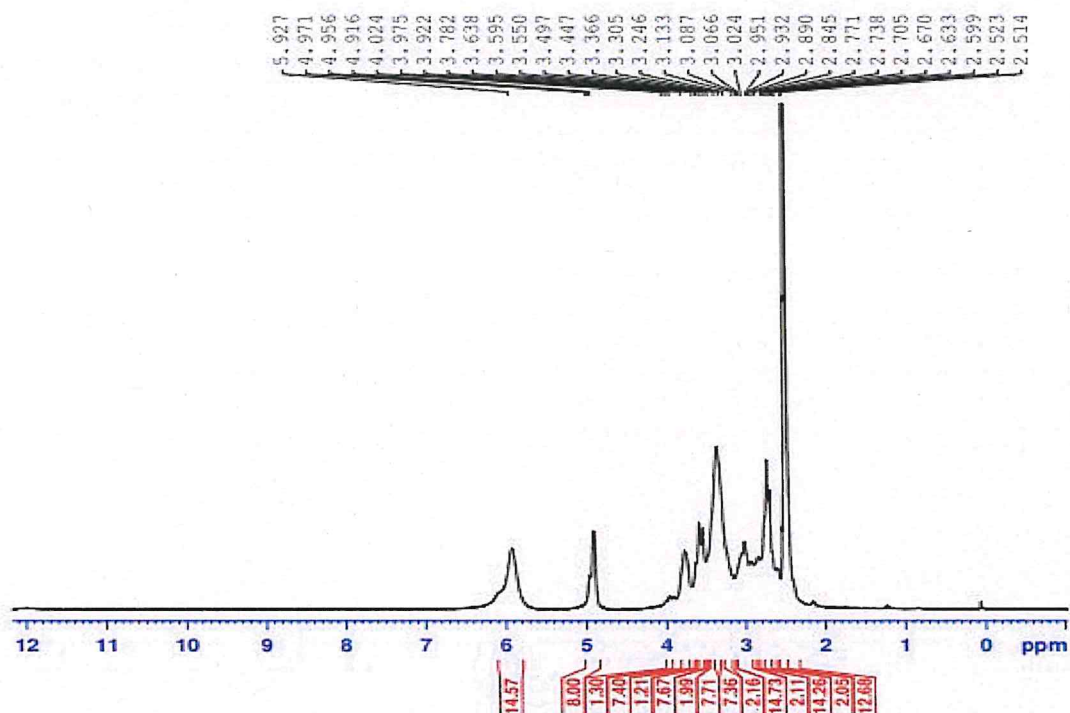
^d carboxylic acid protons got exchanged with DMSO-d₆-water in this ^1H NMR spectrum.

Gopal
21 Jun 23

L. J. L.
21 Jun 2023

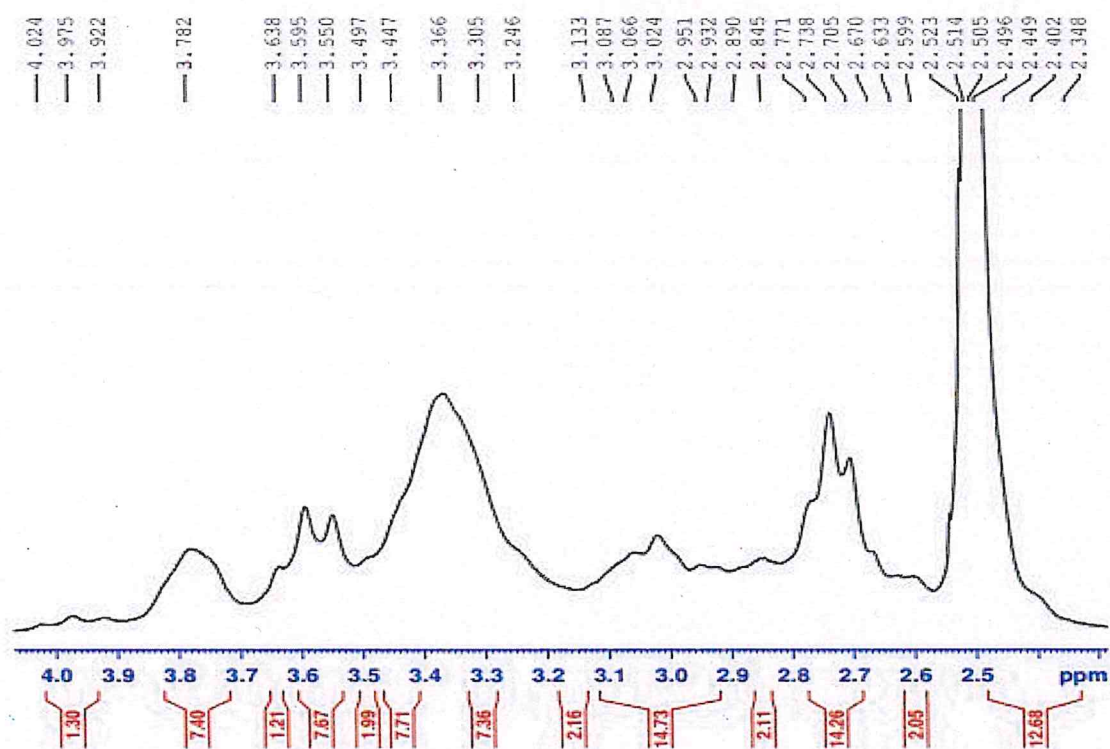
¹H NMR spectrum of Sugammadex sulfoxide diastereomer -2 impurity

B.No : SRD054/SUG-IMP2-II/026/0622



¹H NMR spectrum of Sugammadex sulfoxide diastereomer -2 impurity (Zoomed 1)

B.No : SRD054/SUG-IMP2-II/026/0622

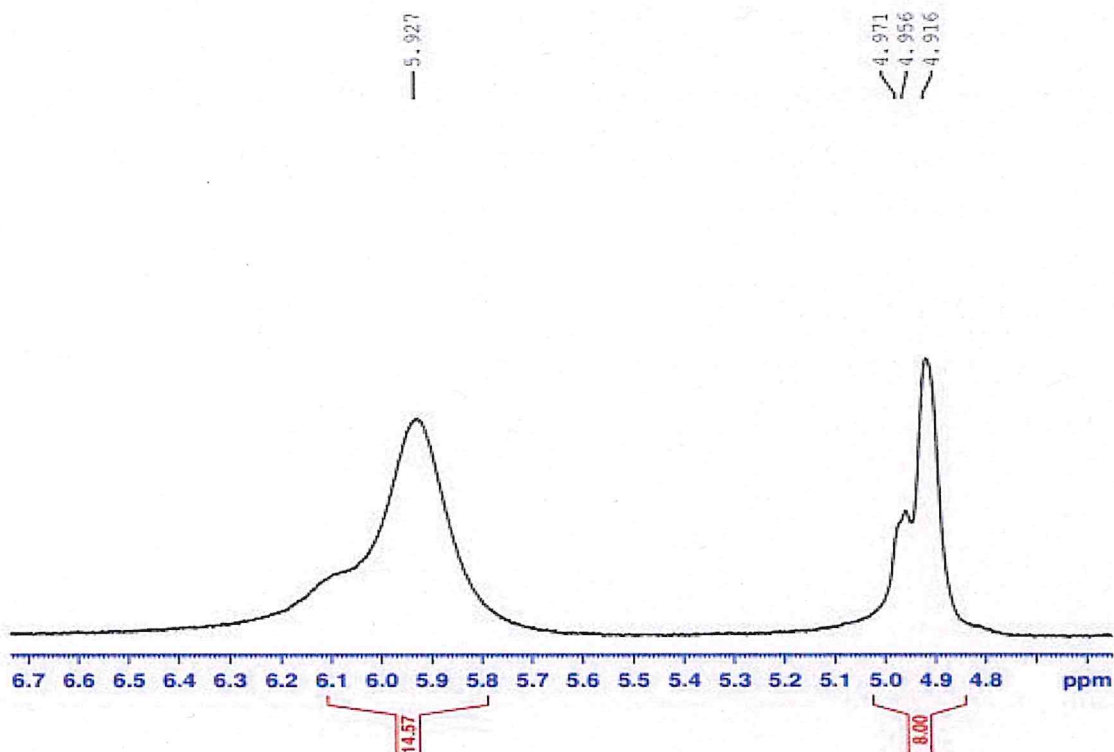


Gefmgs
21 Jun 23

L.H-1
21 Jun 2023

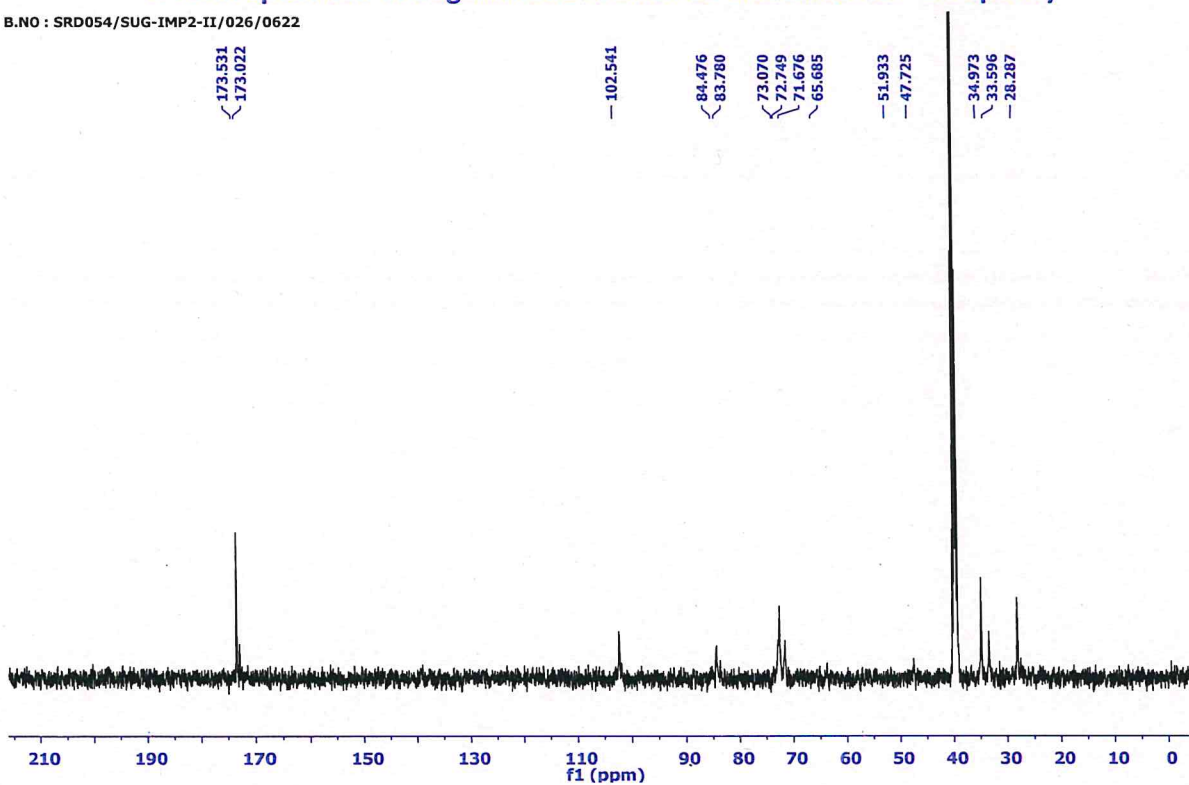
¹H NMR spectrum of Sugammadex sulfoxide diastereomer-2 impurity (Zoomed 2)

B.No : SRD054/SUG-IMP2-II/026/0622



¹³C NMR spectrum of Sugammadex sulfoxide diastereomer -2 impurity

B.No : SRD054/SUG-IMP2-II/026/0622

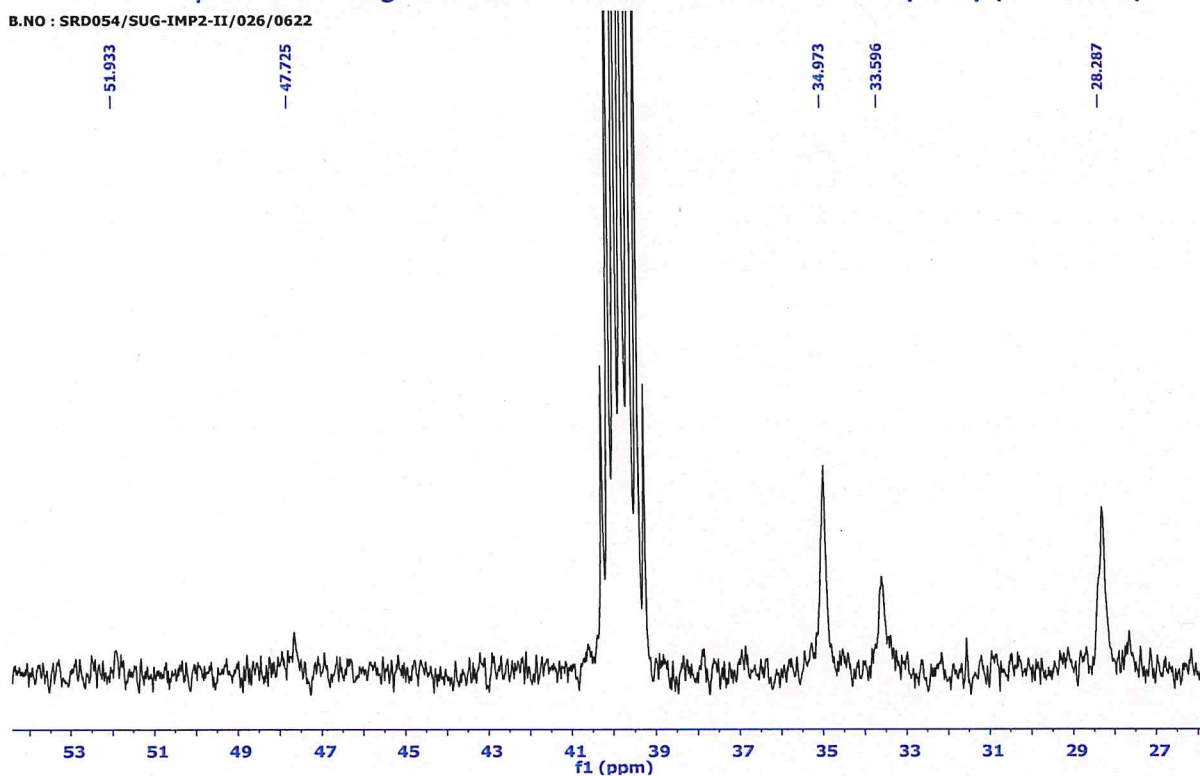


Gokups
21 Jun 23

L.H.
21 Jun 2023

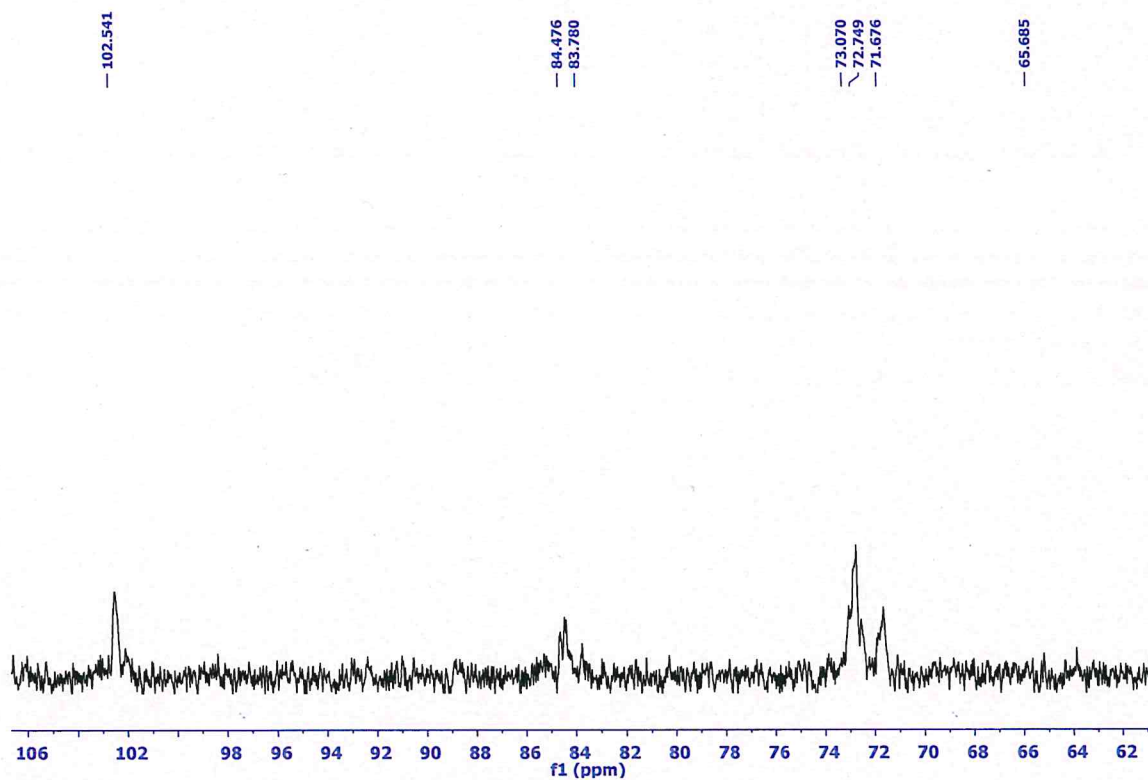
¹³C NMR spectrum of Sugammadex sulfoxide diastereomer-2 impurity (Zoomed 1)

B.NO : SRD054/SUG-IMP2-II/026/0622



¹³C NMR spectrum of Sugammadex sulfoxide Diastereomer -2 impurity (Zoomed 2)

B.NO : SRD054/SUG-IMP2-II/026/0622

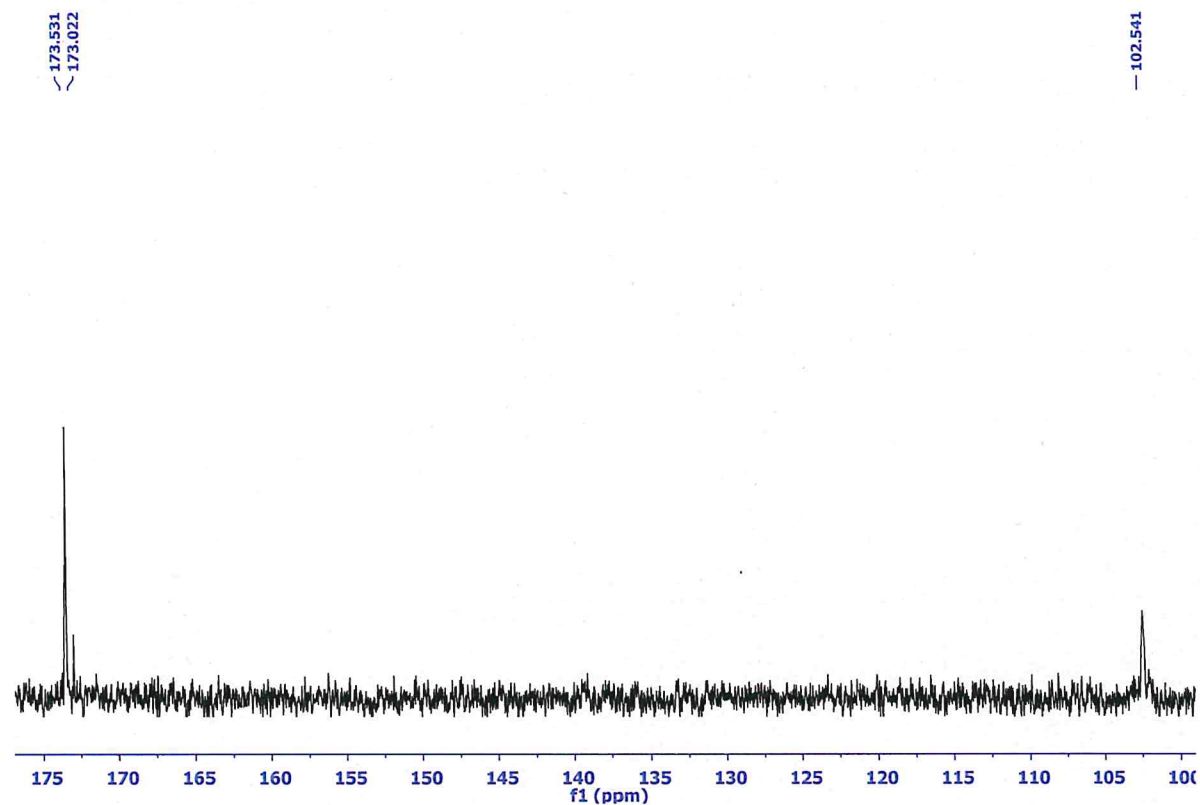


Spkmp/s
21 Jun 23

L.H
21 Jun 2023

¹³C NMR spectrum of Sugammadex sulfoxide Diastereomer -2 impurity (Zoomed 3)

B.NO : SRD054/SUG-IMP2-II/026/0622



Gokul's
21 Jun 23

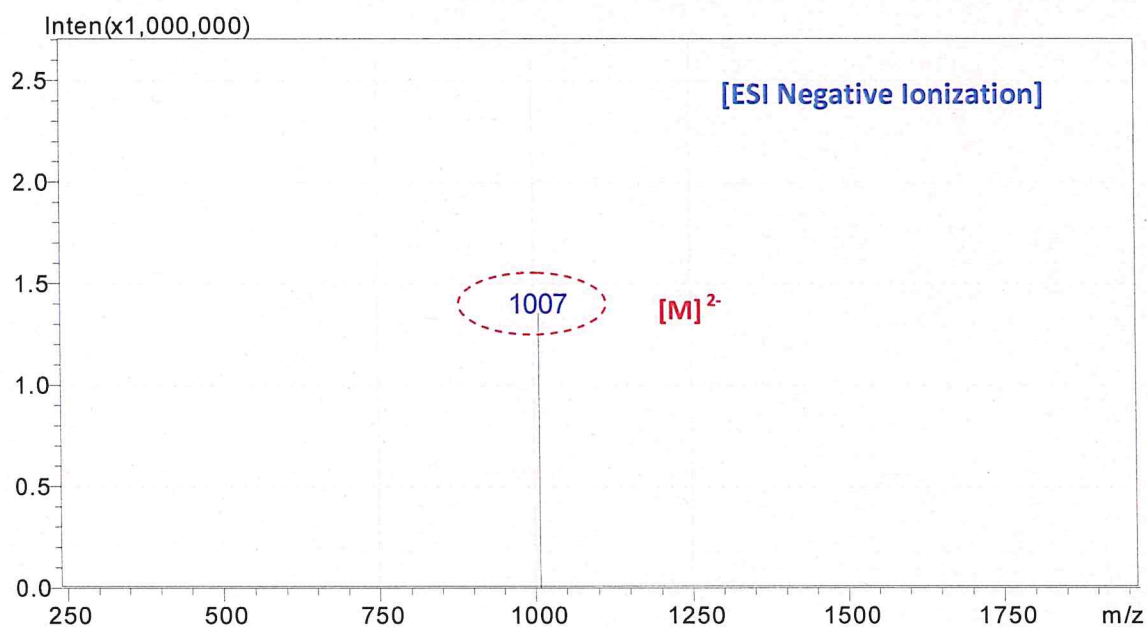
L.H.
21 Jun 23

Mass Spectral data

Method conditions: ESI 3.5kV Negative DL temperature 250°C

The exact mass of Sugammadex sulfoxide diastereomer-2 impurity (SRD054/SUG-IMP2-II/026/0622) is confirmed as 2016Da (Seen as m/z 1007(-Ve) $[M]^{2-}$ di-charged ion) by the signals of ESI mass spectral data.

Mass spectrum of Sugammadex Sulfoxide Diastereomer-2 impurity



Gefang
21 Jun 23

L.M
21 Jun 2023

Purity by HPLC

The purity of Sugammadex sulfoxide diastereomer-2 impurity is analyzed by HPLC using

In-house method

Purity : 96.76% Area

Attached the HPLC chromatogram

Blank



SPINCOTECH PVT LTD
ALATHUR.

Sample Information

Acquired by : Stanis
Sample Name : Blank
Sample ID :
Tray# : 4
Vial# : 12
Injection Volume : 50
Data File : SPL-GIC-006_2006005.lcd
Method File : Sugammadex HPLC mthd.lcm
Batch File : Sugammadex SPL-GIC-006_200623.lcb
Date Acquired : 6/20/2023 6:38:39 PM

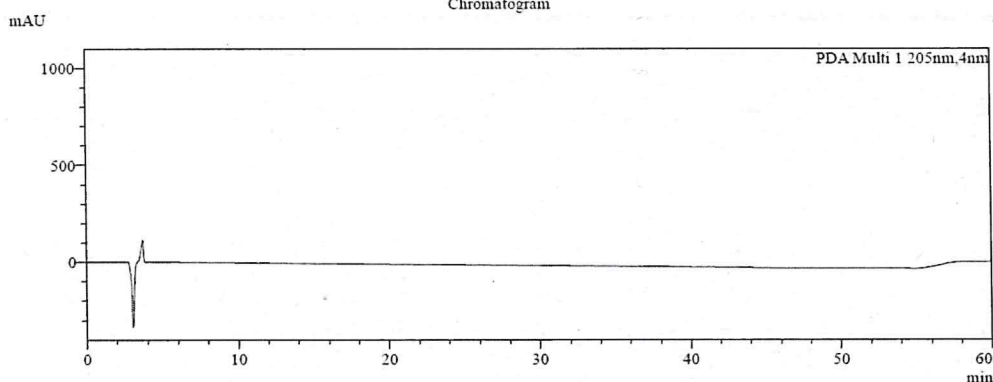
Mobile Phase-A : 0.05% formic acid in 1000mL of water
Mobile Phase-B : Acetonitrile:Methanol (90:10)
Column : Shim-pack GIST C18(150X4.6mm,3µ)
Flow rate : 0.6ml/min

A.R.No:
Analysed by: A. Stanislaus

Method

<<LC Time Program>>		Method			Comment
Time	Module	Command	Value		
0.01	Pumps	B.Conc	20		
40.00	Pumps	B.Conc	25		
50.00	Pumps	B.Conc	25		
52.00	Pumps	B.Conc	20		
60.00	Controller	Stop			

Chromatogram



Peak Table

Peak#	Ret. Time	Area	Area%	Name	RRT
Total					

Gokul S
21 Jun 23

L.H
21 Jun 2023

Sugammadex sulfoxide diastereomer-2 impurity



**SPINCOTECH PVT LTD
ALATHUR.**

Sample Information

Acquired by : Stanis
 Sample Name : Sugammadex sulfoxide Diastereomer-2 Impurity
 Sample ID : SRD054/SUG-IMP2-II/026/0622
 Tray# : 4
 Vial# : 15
 Injection Volume : 50
 Data File : SPL-GIC-006_2006008.lcd
 Method File : Sugammadex HPLC mthd..lcm
 Batch File : Sugammadex SPL-GIC-006_200623.lcb
 Date Acquired : 6/20/2023 9:39:54 PM

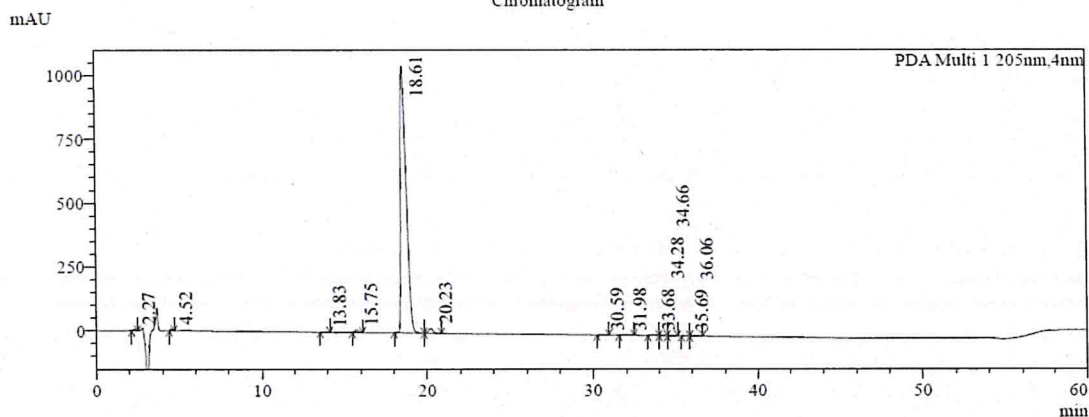
Mobile Phase-A : 0.05% formic acid in 1000mL of water
 Mobile Phase-B : Acetonitrile:Methanol (90:10)
 Column : Shim-pack GIST C18(150X4.6mm.3μ)
 Flow rate : 0.6ml/min

A.R.No:SRD054/SUG-IMP2-II/026/0622/AR23-3850
 Analysed by:A.Stanislaus

<<LC Time Program>>

Time	Module	Command	Value	Comment
0.01	Pumps	B.Conc	20	
40.00	Pumps	B.Conc	25	
50.00	Pumps	B.Conc	25	
52.00	Pumps	B.Conc	20	
60.00	Controller	Stop		

Chromatogram



Peak Table

Peak#	Ret. Time	Area	Area%	Name	RRT
1	2.27	49073	0.19		0.12
2	4.52	48785	0.19		0.24
3	13.83	14284	0.06		0.74
4	15.75	154682	0.61		0.85
5	18.61	24411544	96.76	Sugammadex sulfoxide Diastereomer-2 Impurity	1.00
6	20.23	343734	1.36		1.09
7	30.59	19827	0.08		1.64
8	31.98	52844	0.21		1.72
9	33.68	26076	0.10		1.81
10	34.28	25742	0.10		1.84
11	34.66	23829	0.09		1.86
12	35.69	20458	0.08		1.92
13	36.06	37841	0.15		1.94
Total		25228718	100.00		

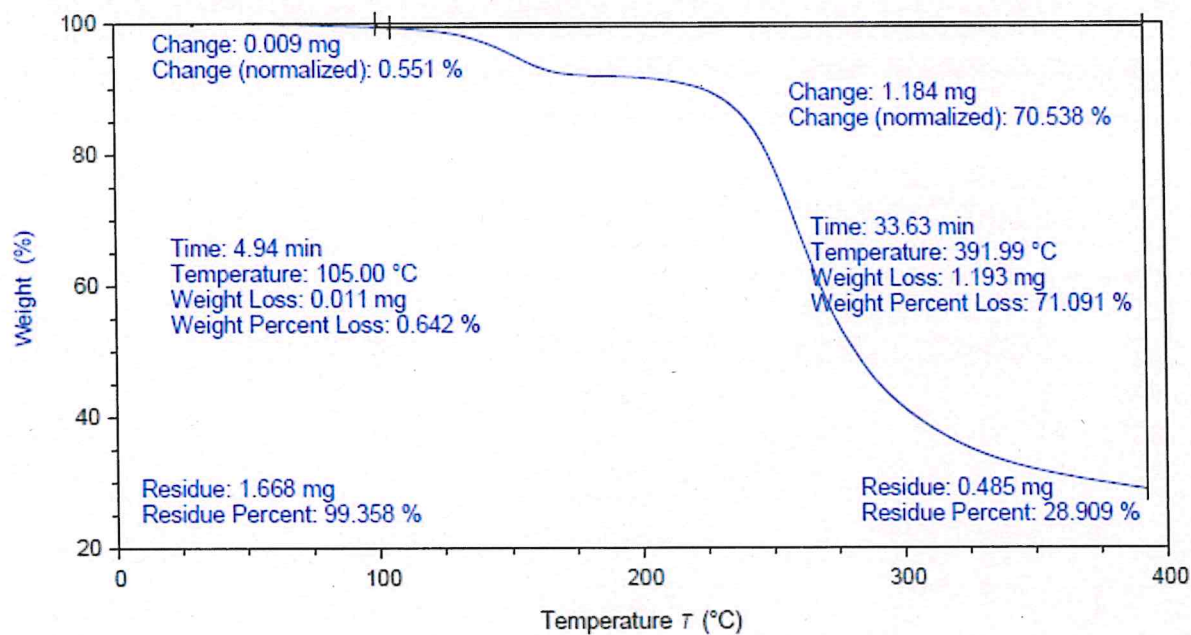
Gokup-S
21 Jun 23

Lil-L
21 Jun 2023

Volatile Loss Analysis by Thermogravimetry (TGA)

Sample Name: Sugammadex sulfoxide diastereomer-2 impurity

Batch No. : SRD054/SUG-IMP2-II/026/0622



TA Instruments TGA V5.1.0.46403

Volatile loss Calculation:

Volatile loss: Initial percentage – percentage after volatile loss

$$= 100 - 99.358\%$$

$$= 0.64\% \text{ w/w}$$

Percentage of Volatile loss = 0.64 % w/w

Spk
21 Jun 23

Lil
21 Jun 23

Impurity Potency Calculation

Sample Name: Sugammadex sulfoxide diastereomer-2 impurity

Batch No. : SRD054/SUG-IMP2-II/026/0622

Potency Calculation:

Potency : Purity – Percentage of volatile loss

= 96.76% - 0.64% w/w

= 96.12% w/w

Potency = 96.12% w/w