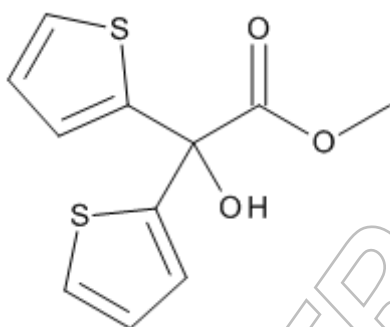




Certificate of Analysis

Reference Standard

Methyl 2-Hydroxy-2,2-dithiophen-2-ylacetate



Molecular Formula: C₁₁H₁₀O₃S₂
Molecular Weight: 254.33
CAS Number: 26447-85-8

Catalogue Number: MM1293.05
Lot Number: 451704
Long-term Storage: 2 to 8 °C, dark
Appearance: light brown solid
Melting Point: 93 °C
Assay 'as is': 99.0 %

Date of shipment: **2018-July-02**

This certificate is valid for two years from the date of shipment provided the substance is stored under the recommended conditions unopened in the original container.

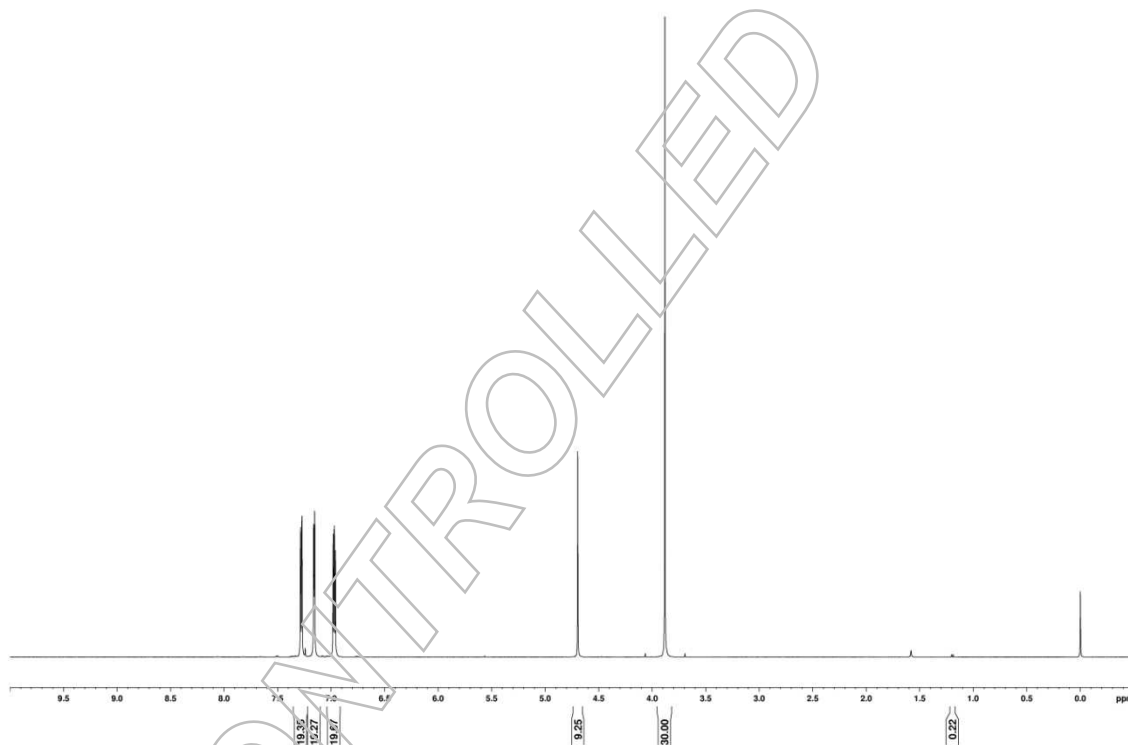


I. Identity

The identity of the reference substance was established by following analyses.

1a. ¹H-NMR Spectrum

Conditions: 400 MHz, CDCl₃

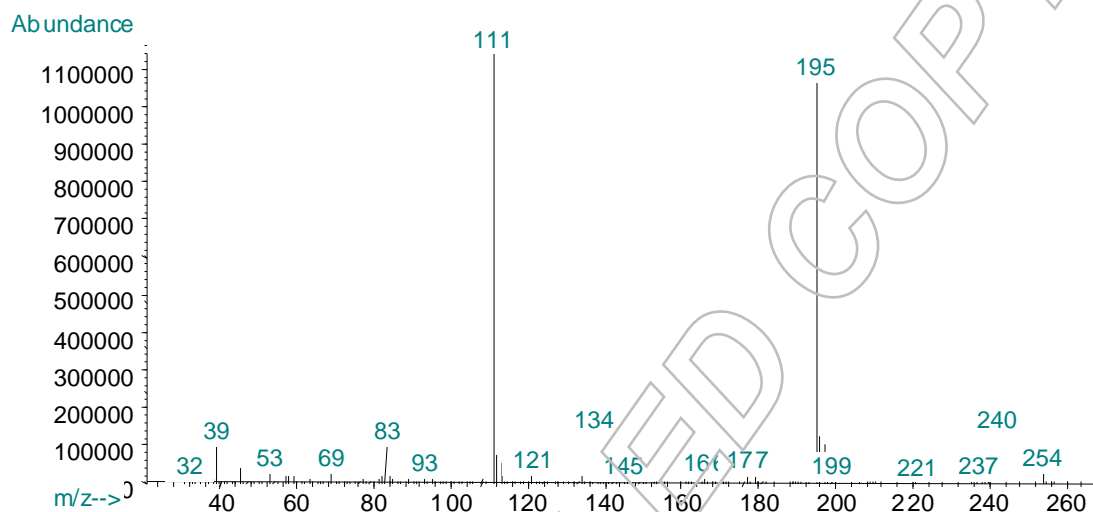


The structure is confirmed by the signals of the spectrum and their interpretation.



Ib. Mass Spectrum

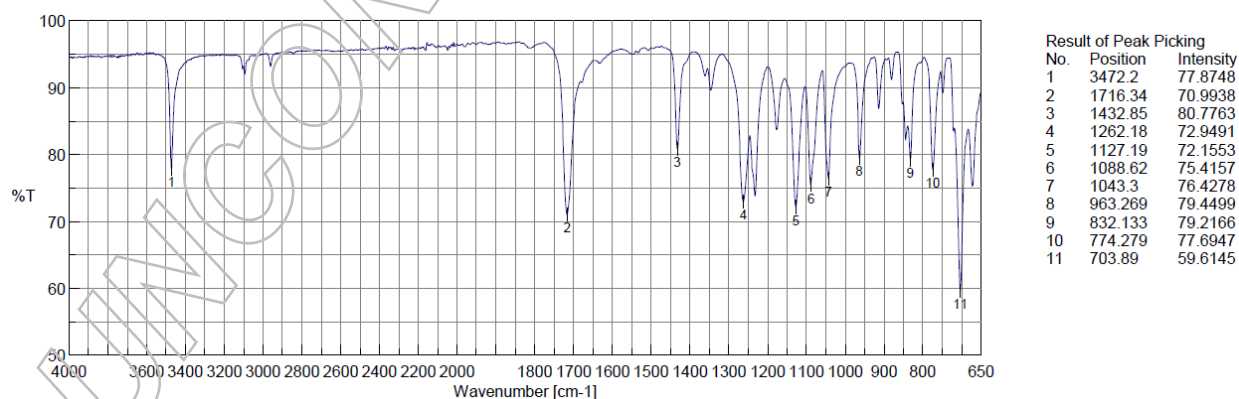
Method: EI, 70eV, detector temperature: 280 °C



The signals of the mass spectrum and their interpretation are consistent with the structural formula.

Ic. IR Spectrum

Method: Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) Spectroscopy



The signals of the IR spectrum and their interpretation are consistent with the structural formula.



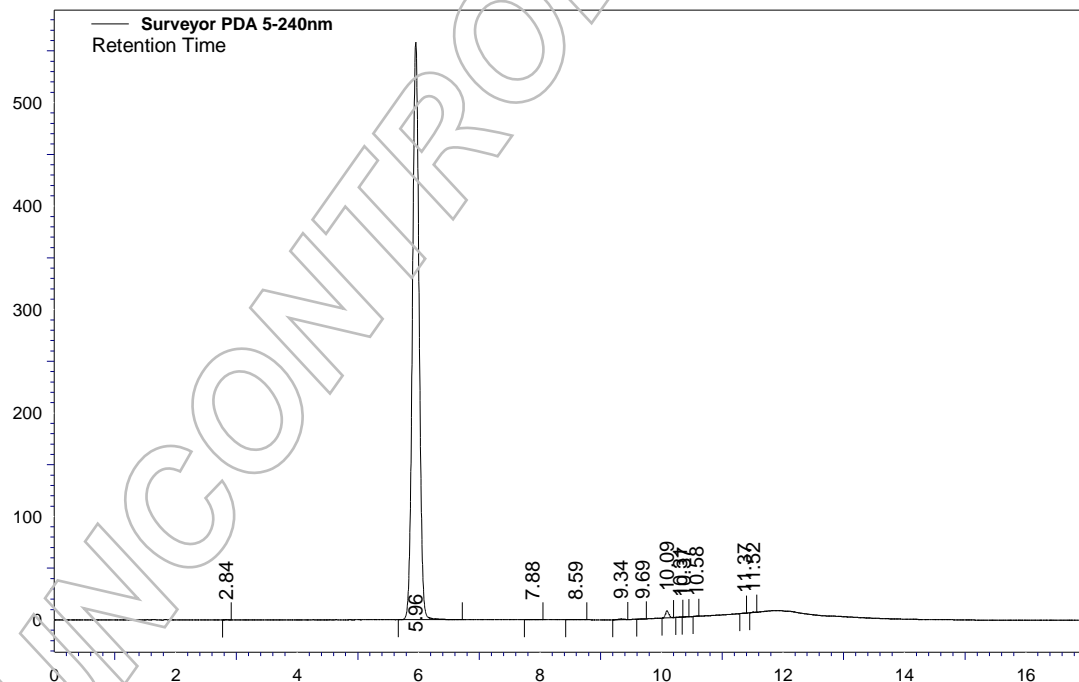
II. Purity

IIa. High Performance Liquid Chromatography (HPLC)

The purity of the reference substance was analysed by high performance liquid chromatography (HPLC).

HPLC Conditions:

Column:	Conditions:	Detector:	Injector:
Hypersil Gold C18	1.0 ml/min, 40 °C	DAD	Auto
5 µm, 150 x 4.6 mm	0-6 min Water/Acetonitrile 60/40	240 nm	3 µl; 0.0952 mg/ml in
	6-9 min Water/Acetonitrile to 10/90		Water/Acetonitrile 50/50 (v/v)
	9-12 min Water/Acetonitrile to 60/40		
	12-17 min Water/Acetonitrile 60/40 (v/v);		
	0.1 % H ₃ PO ₄		





Area Percent Report - Sorted by Signal

Pk #	Retention Time	Area	Area %
1	2.84	769	0.02
2	5.96	4244568	99.11
3	7.88	1313	0.03
4	8.59	1794	0.04
5	9.34	4104	0.10
6	9.69	438	0.01
7	10.09	26241	0.61
8	10.31	329	0.01
9	10.37	373	0.01
10	10.58	715	0.02
11	11.37	790	0.02
12	11.52	1288	0.03
Totals		4282722	100.00

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

Results:

Average 99.11 %
Number of results n=3
Standard deviation < 0.01 %

IIb. Water Content

Method: Karl Fischer titration

Results:

Average 0.05 %
Number of results n=3
Standard deviation < 0.01 %



IIc. Residual Solvents

Method: ¹H-NMR

Result: 0.09 % 2-Propanol

III. Final Result

Chromatographic purity (HPLC)	99.11 %
Water content	0.05 %
Residual solvents	0.09 %
Assay (100 % method)¹	98.97 %

The assay is assessed to be 99.0 % 'as is'

The assay 'as is' is equivalent to the assay based on the not anhydrous and not dried substance respectively.

Release Date:

Luckenwalde, 2018-03-22

Dr. Sabine Schröder
Product Release

¹ The calculation of the 100 % method follows the formula:

$$\text{Assay (\%)} = (100 \% - \text{volatile contents}) * \frac{\text{Purity (\%)}}{100 \%}$$

Volatile contents are considered as absolute contributions, purity is considered as relative contribution.