Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information belonging to the manuscript

Phenothiazine electrophores loaded periodic mesoporous organosilicas by ion exchange immobilization

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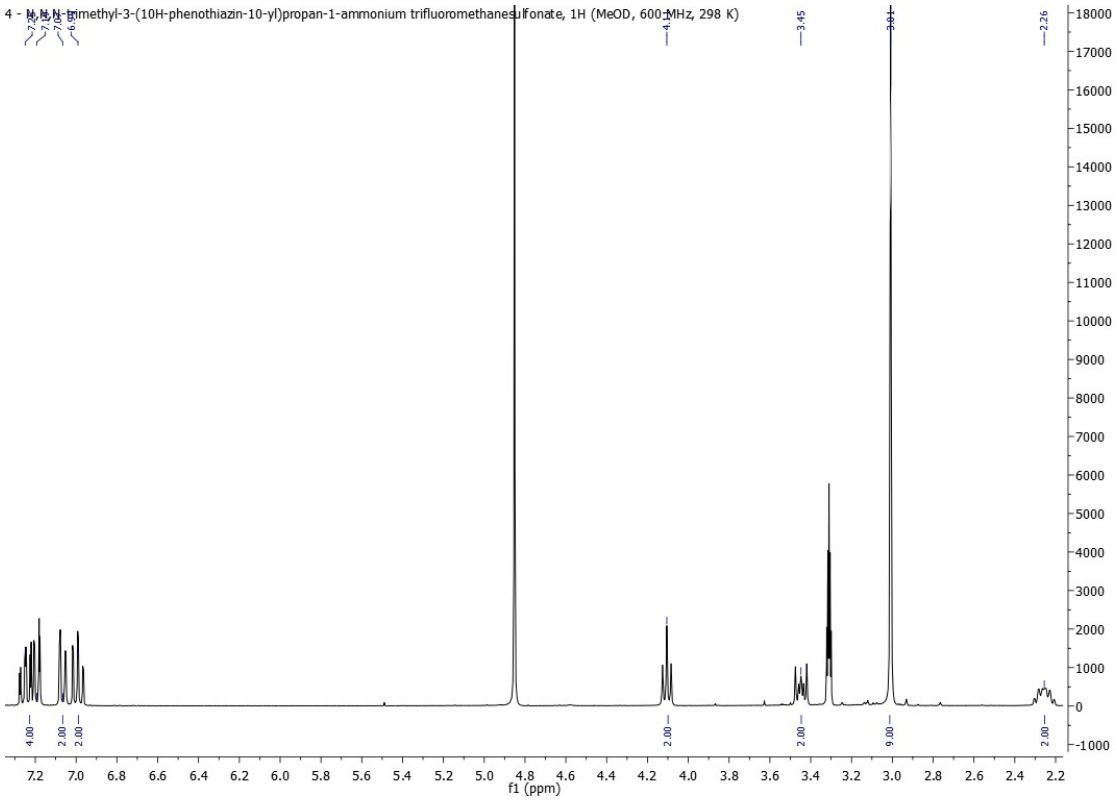
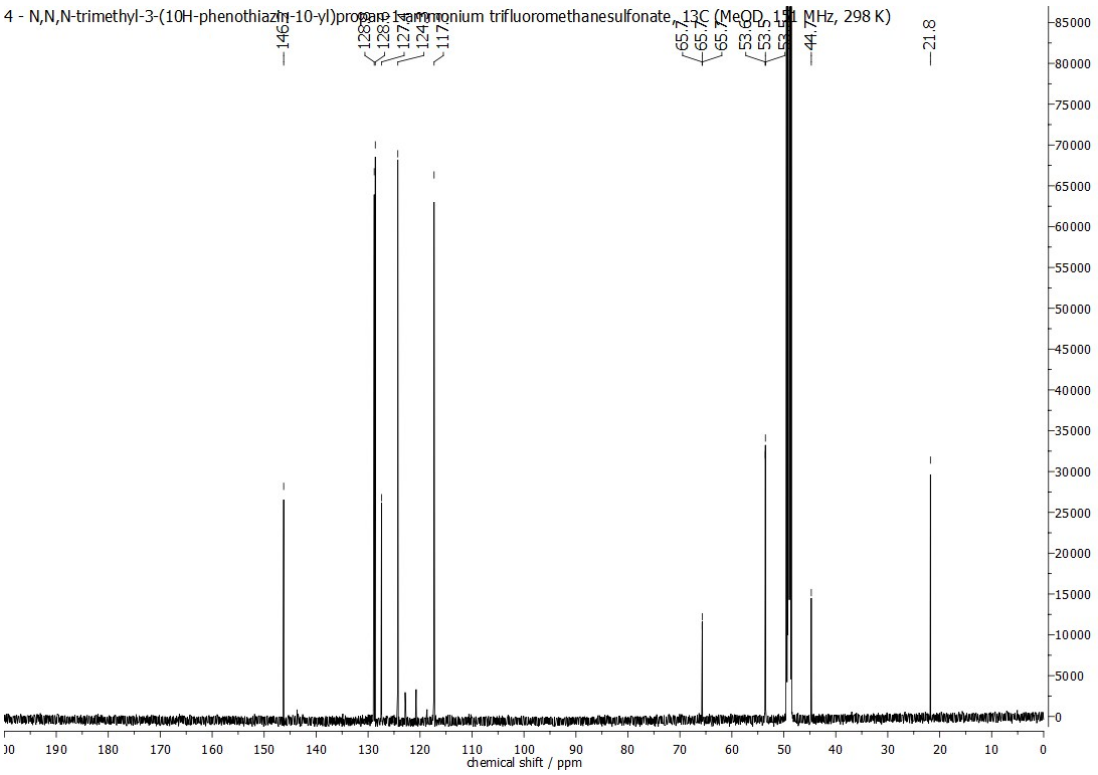
† In memoriam to Prof. Dr.-Ing. Stefan Ernst who deceased on Jan. 28, 2019.

N,*N*,*N*-Trimethyl-3-(10*H*-phenothiazin-10-yl)propan-1-ammonium trifluoromethanesulfonate (**4**)

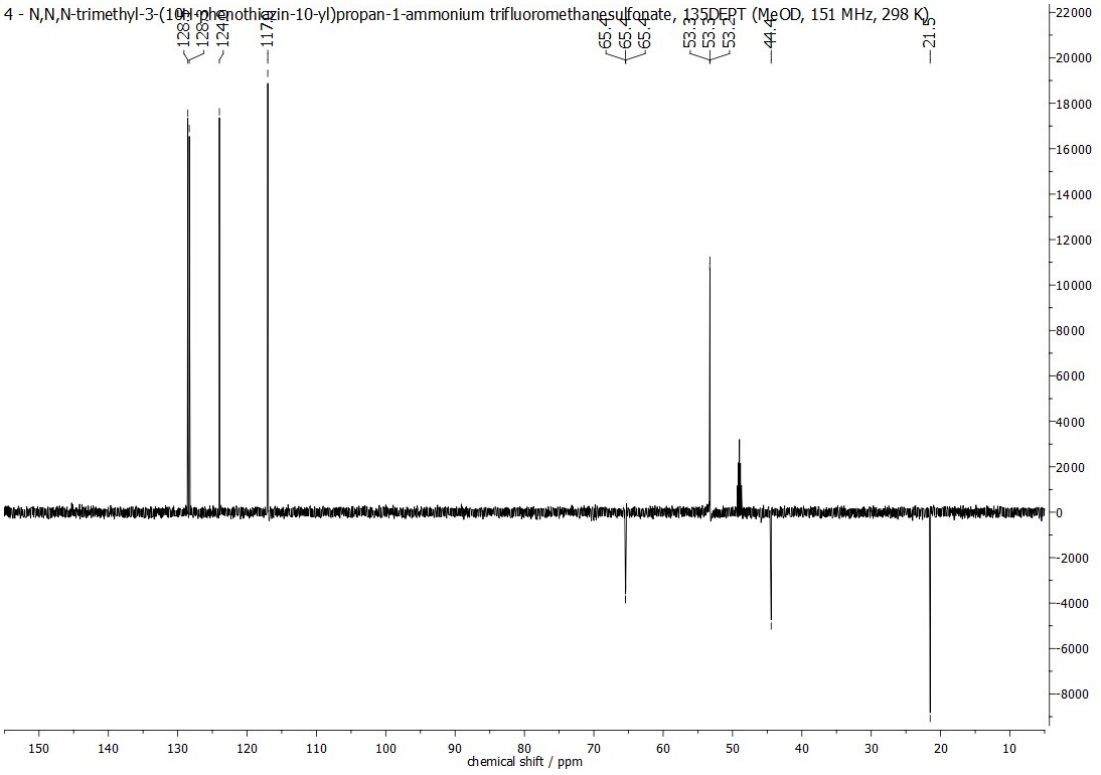
^{1}H NMR spectrum



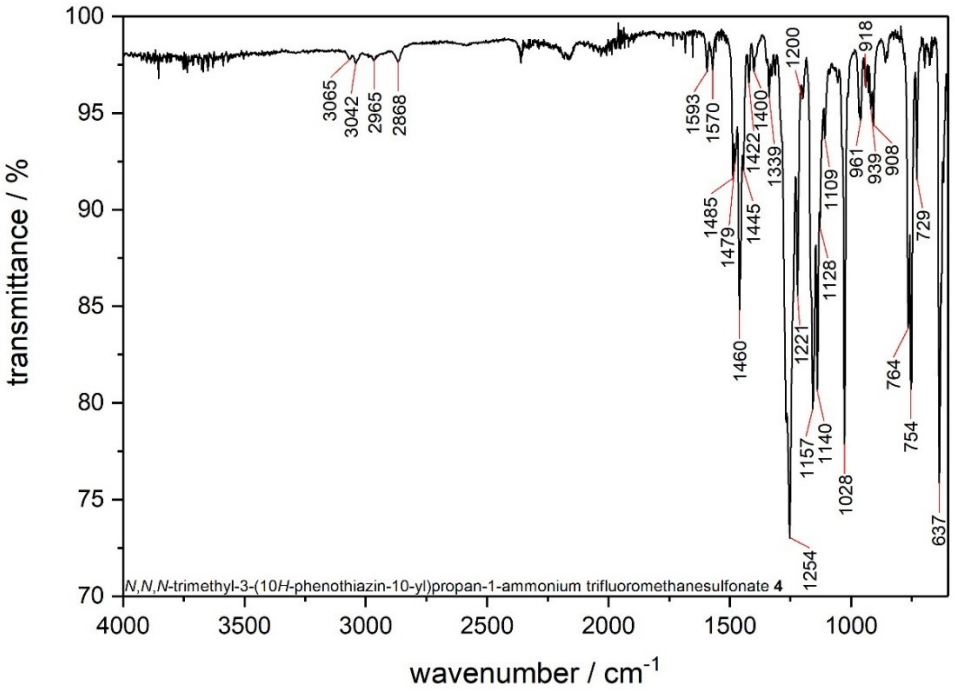
^{13}C NMR spectrum



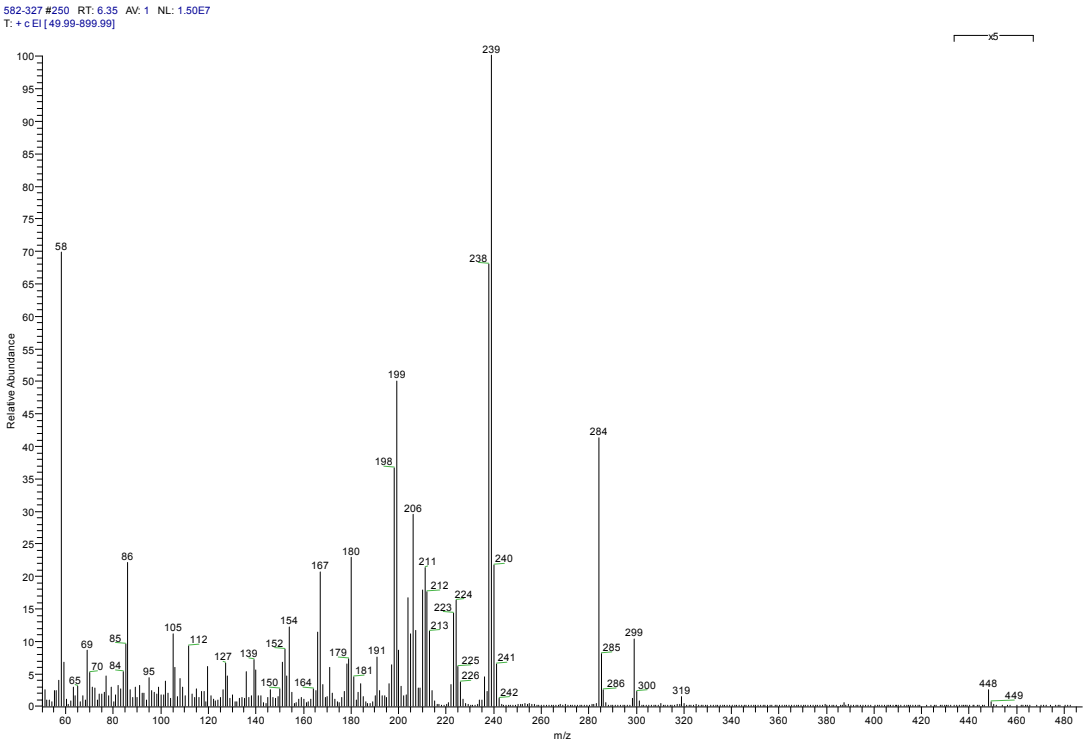
135DETP NMR spectrum



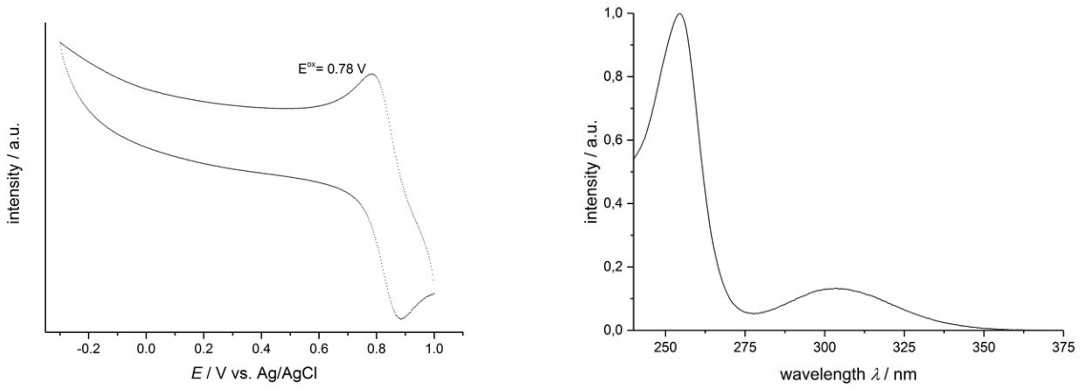
IR spectrum



EI-MS spectrum

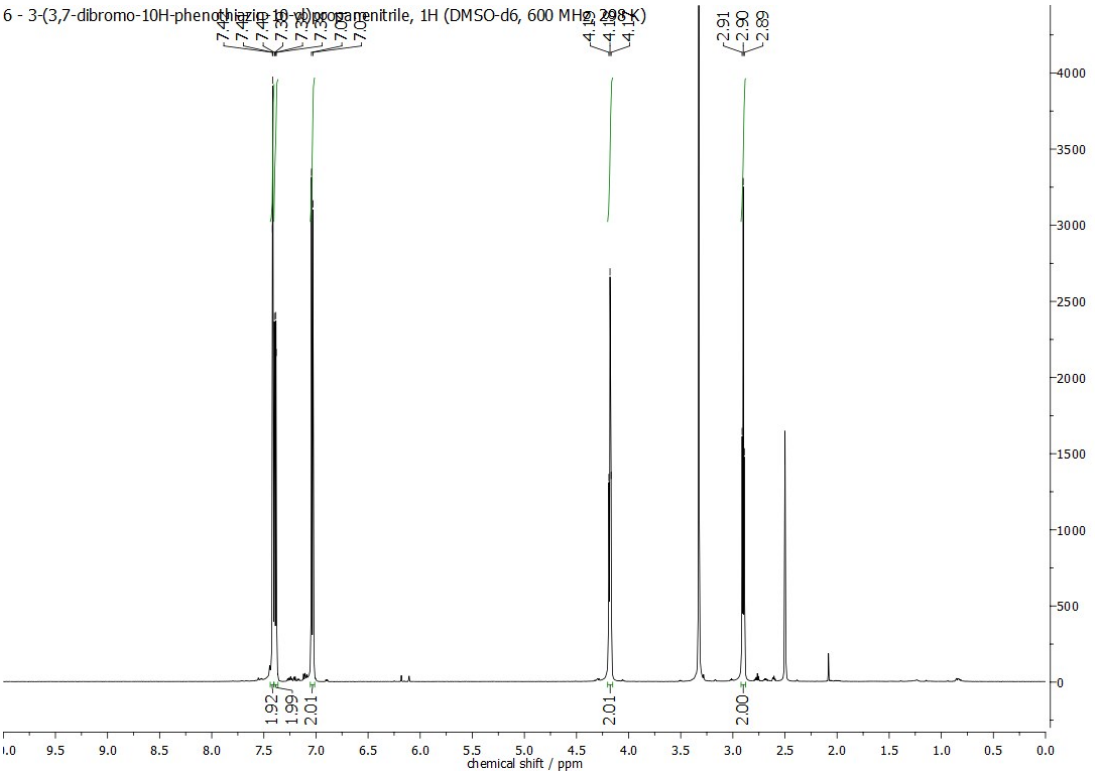


Cyclic voltammogram (left) and UV/Vis spectrum (right) of **4** CV: DCM, T = 20 °C, v = 100 mVs^{-1}, electrolyte: ($^{n}Bu_4N)PF_6$, Pt working electrode, Pt counter electrode, Ag/AgCl reference electrode; UV/Vis: DCM, T = 20 °C, [1]$\Delta\tilde{\nu} = 1/\lambda_{max,abs} - 1/\lambda_{max,em}$.

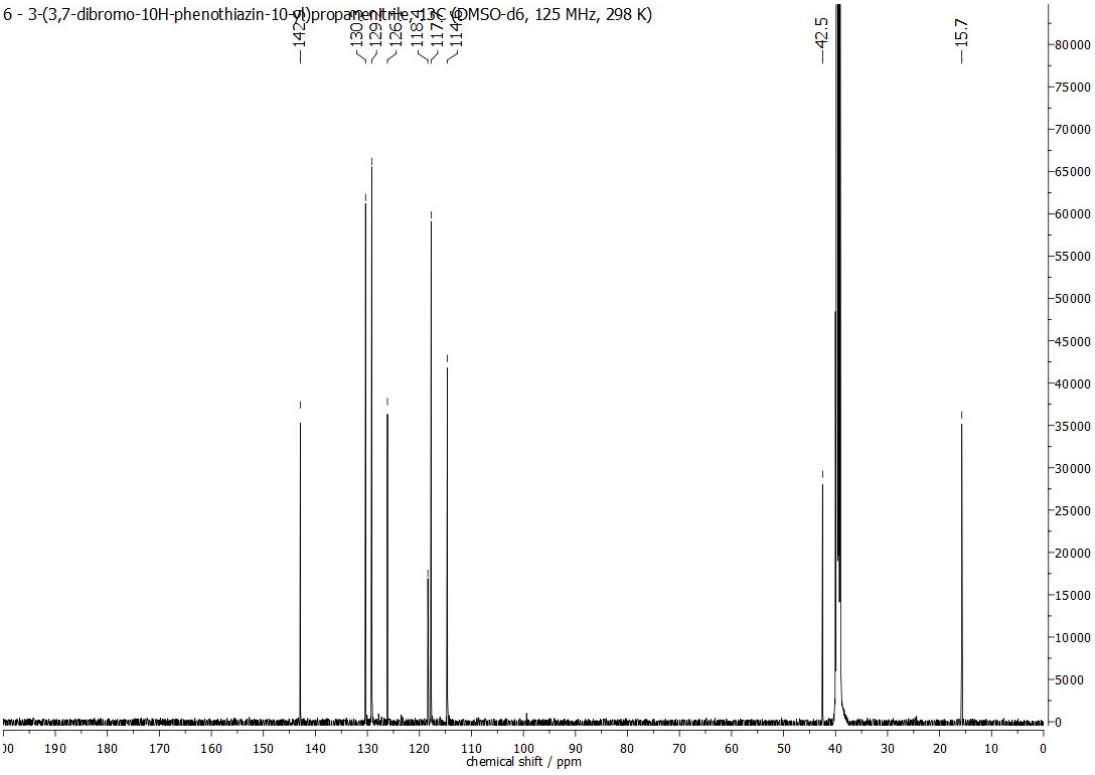


3-(3,7-Dibromo-10*H*-phenothiazin-10-yl)propanenitrile (**6**)

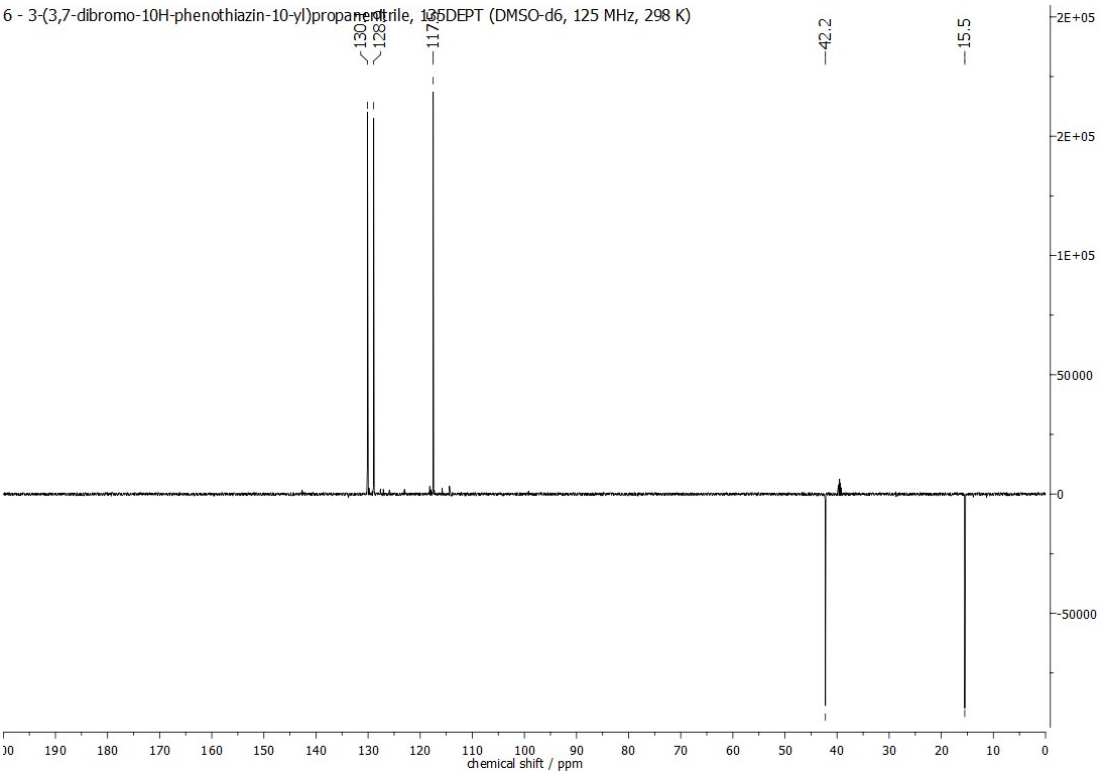
^{1}H NMR spectrum



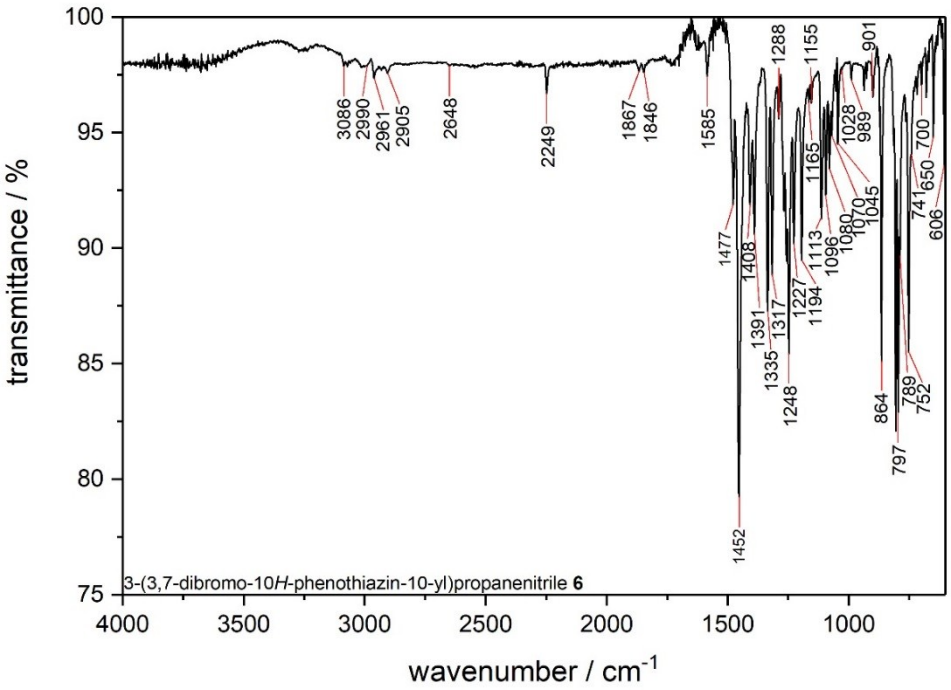
^{13}C NMR spectrum



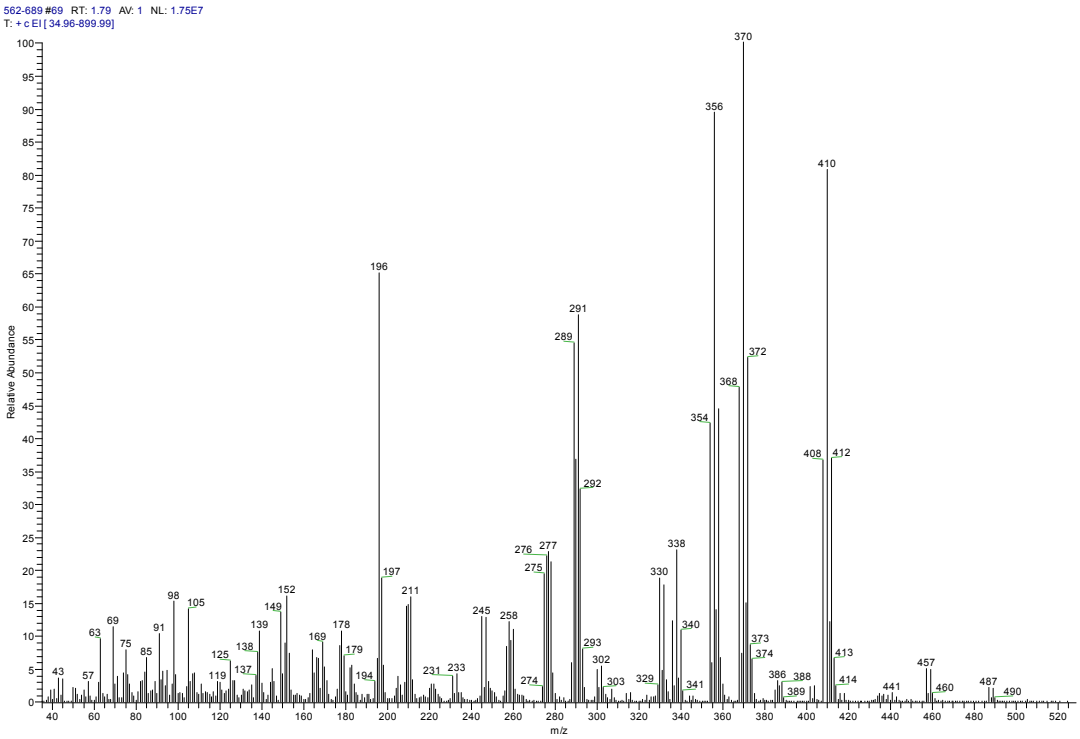
135DETP NMR spectrum



IR spectrum

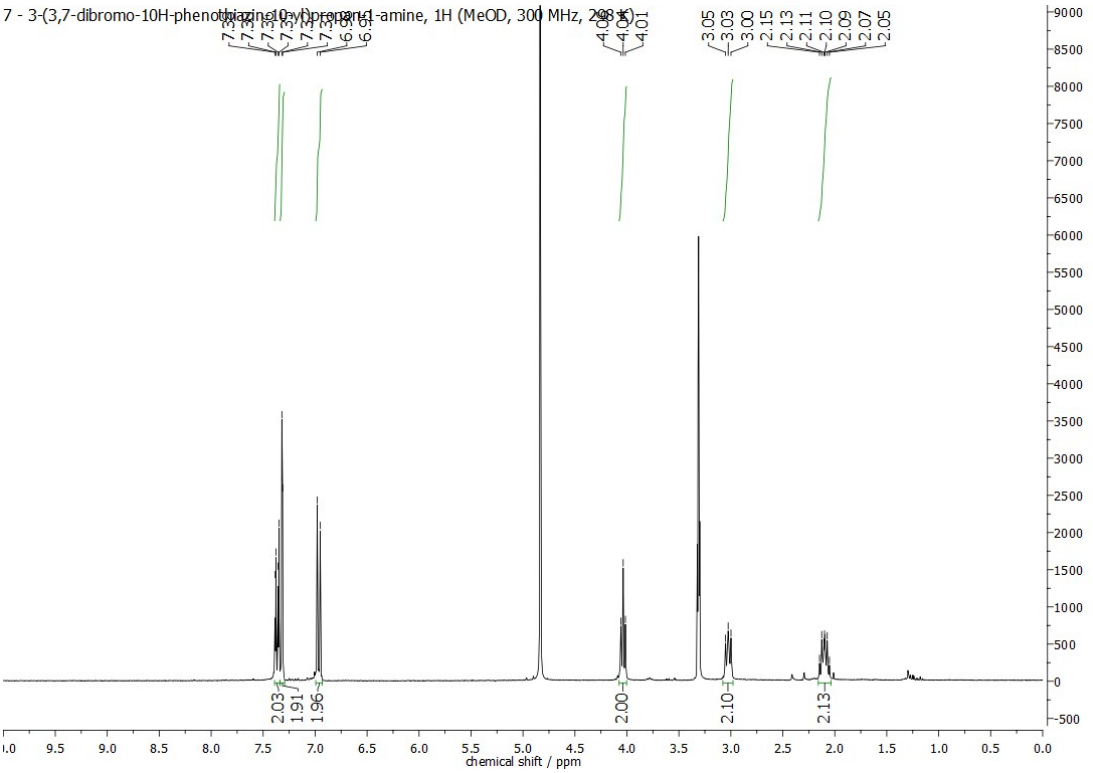


EI-MS spectrum

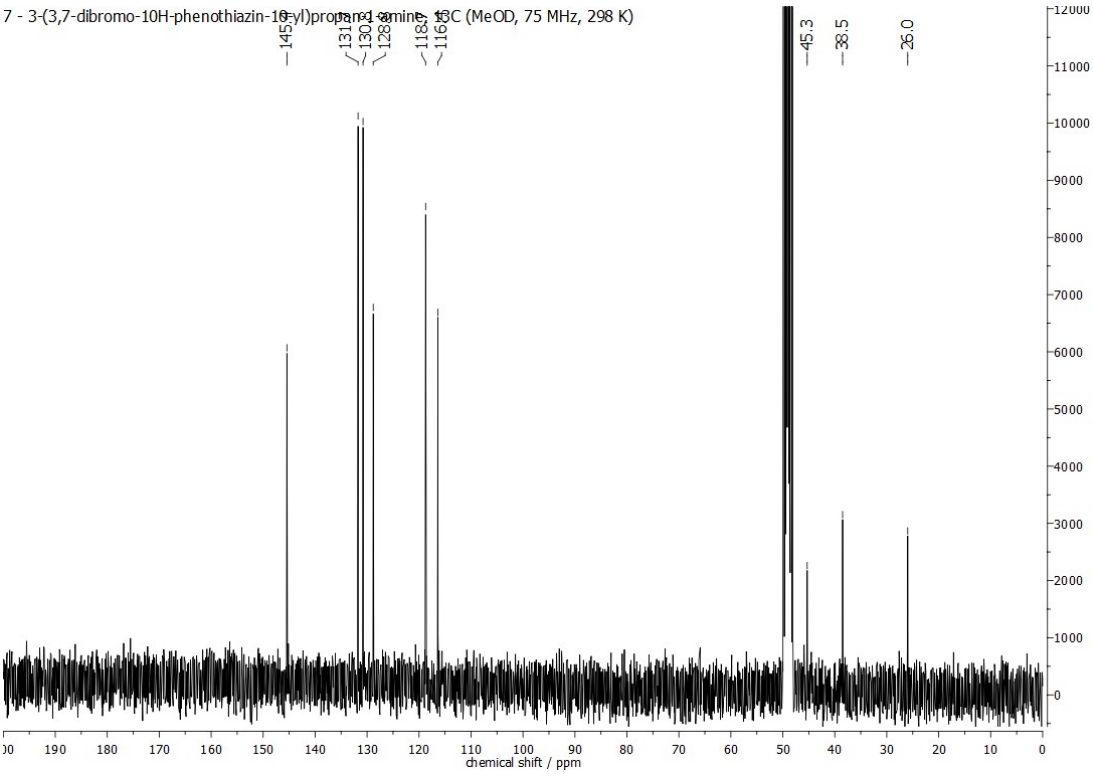


3-(3,7-Dibromo-10*H*-phenothazin-10-yl)propan-1-amine (**7**)

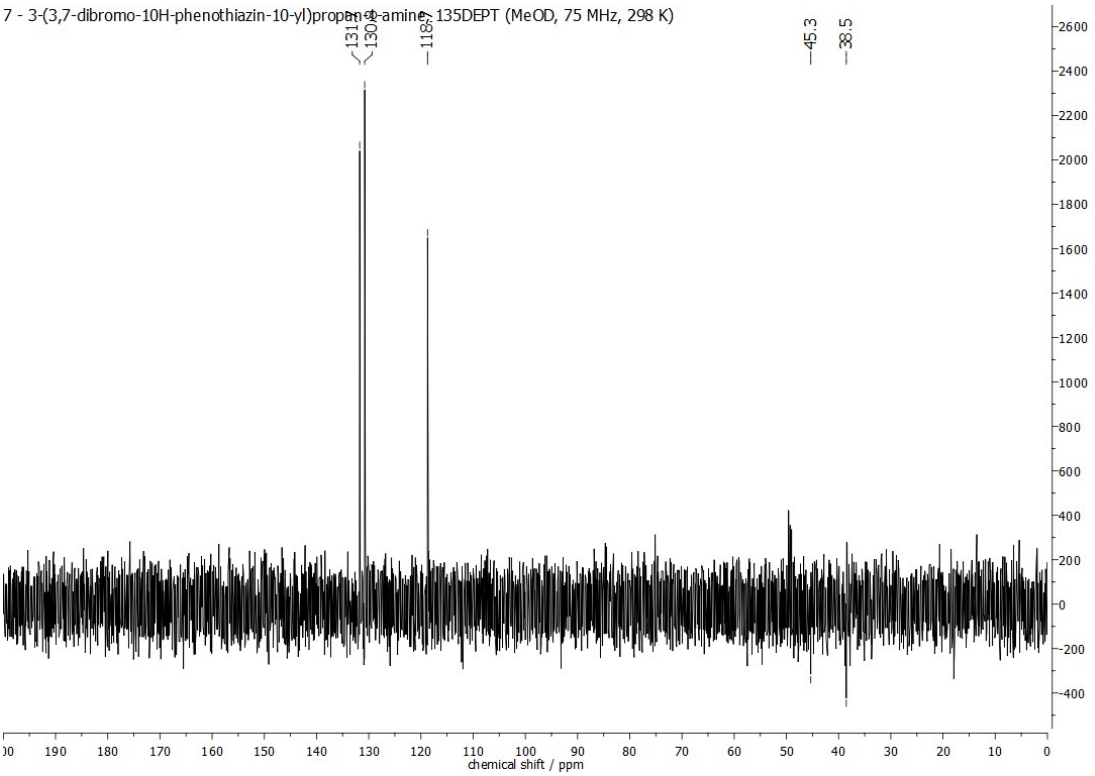
^{1}H NMR spectrum



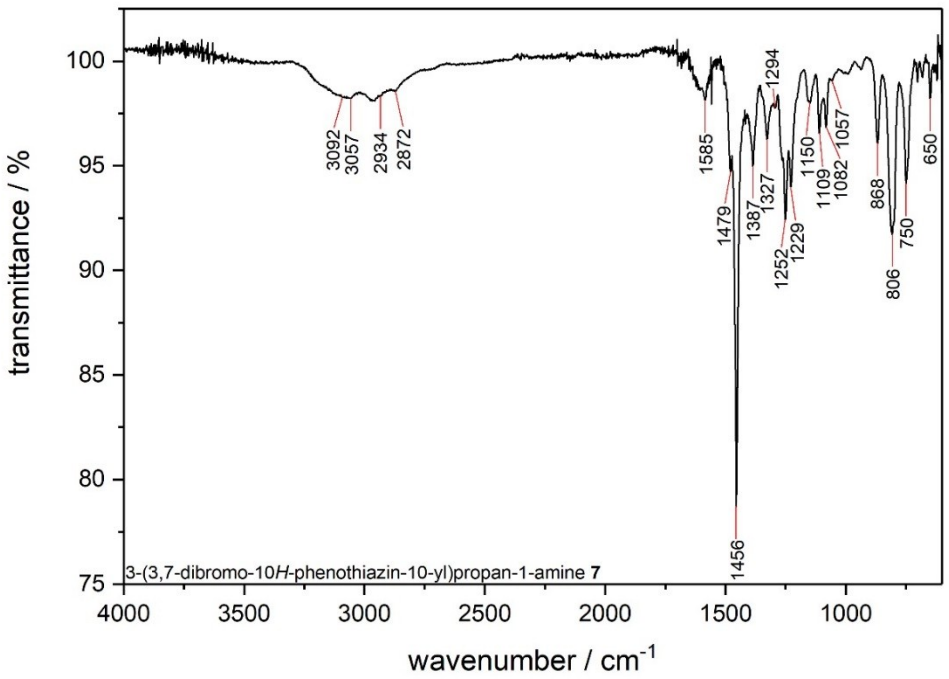
^{13}C NMR spectrum



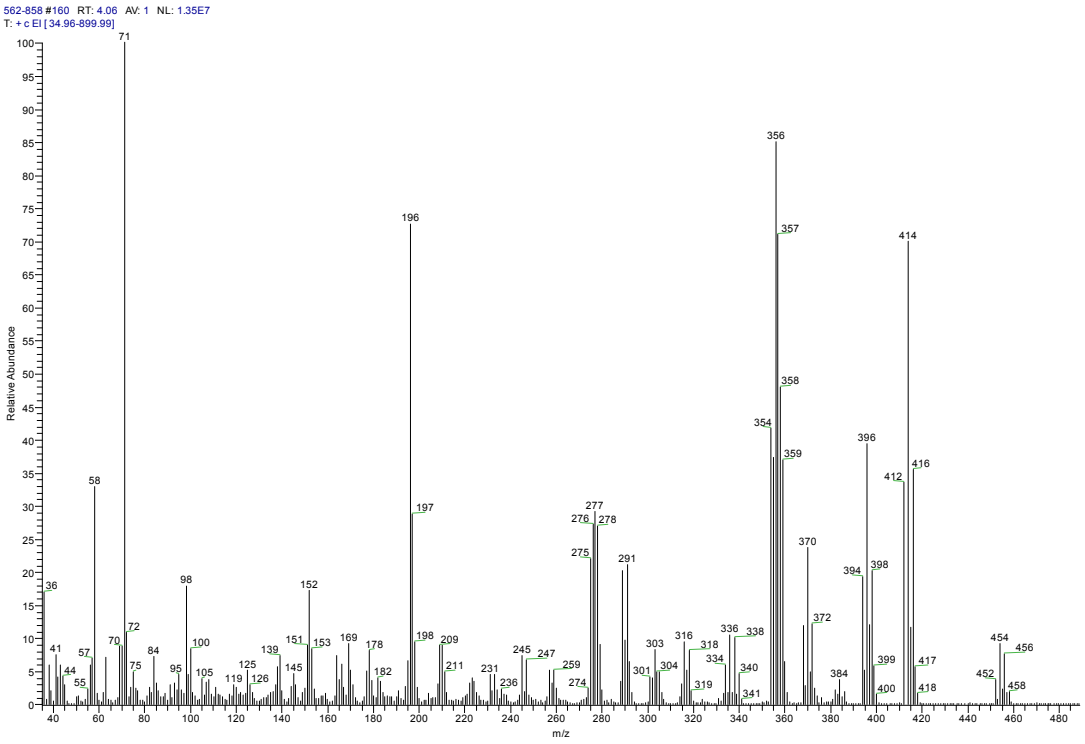
135DETP NMR spectrum



IR spectrum

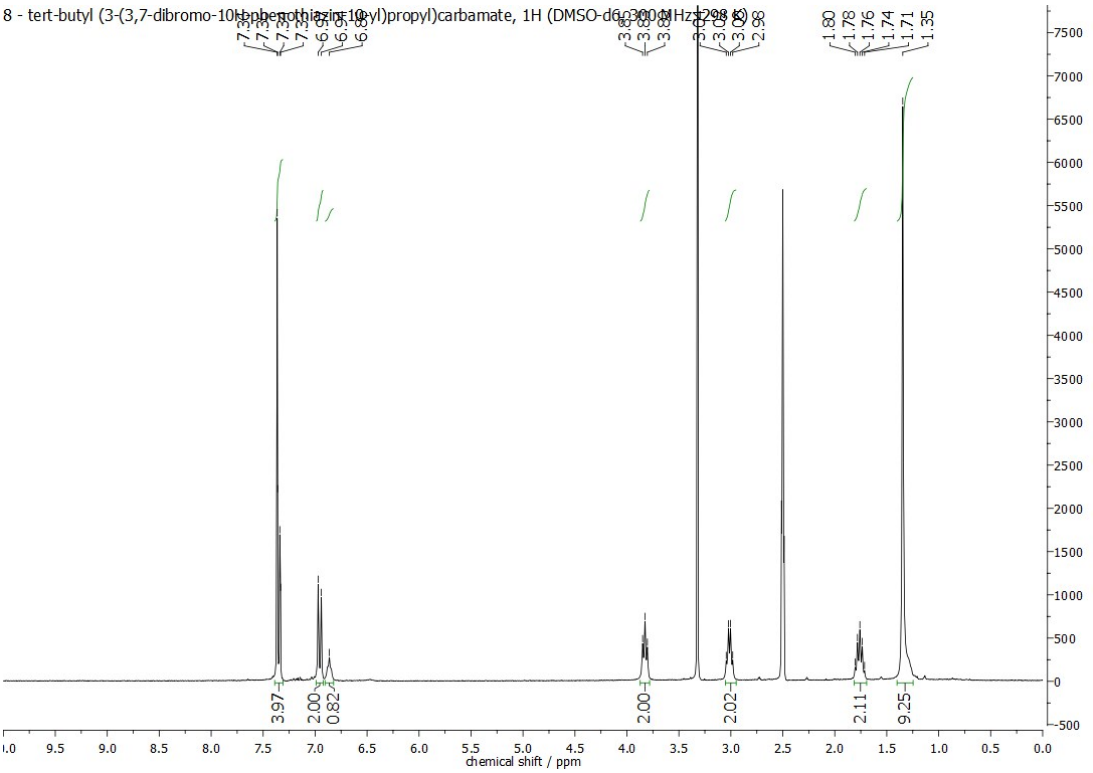


EI-MS spectrum

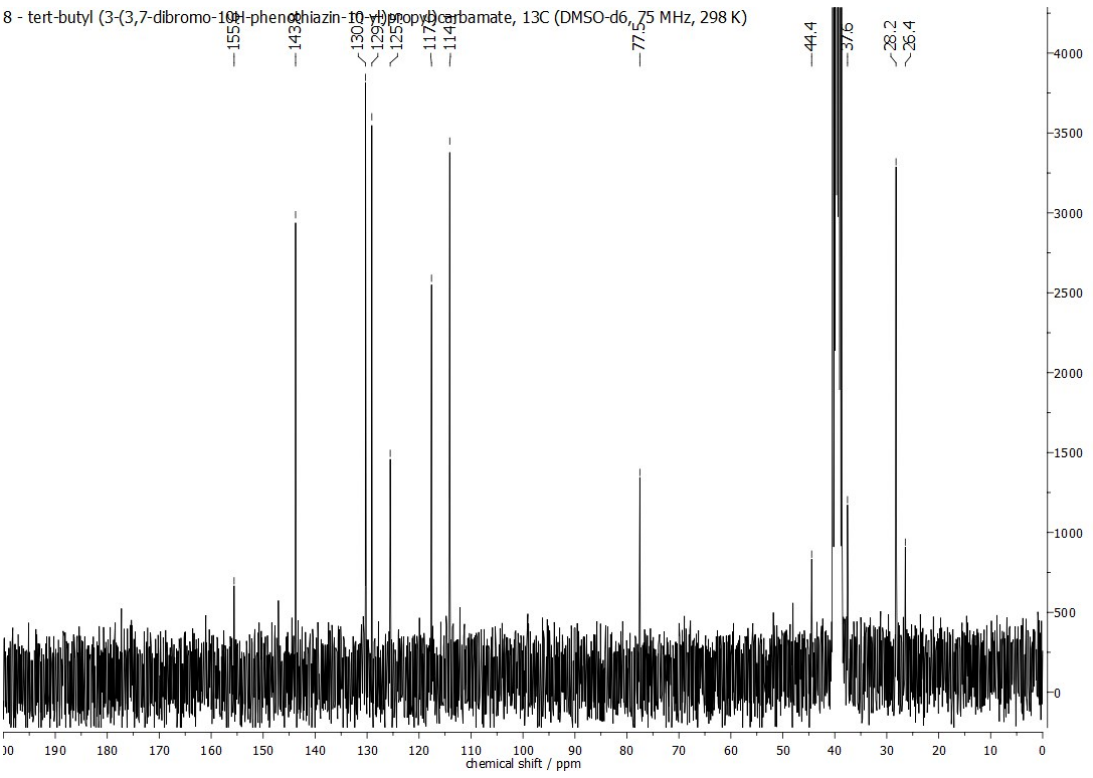


tert-Butyl (3-(3,7-dibromo-10*H*-phenothiazin-10-yl)propyl)carbamate (**8**)

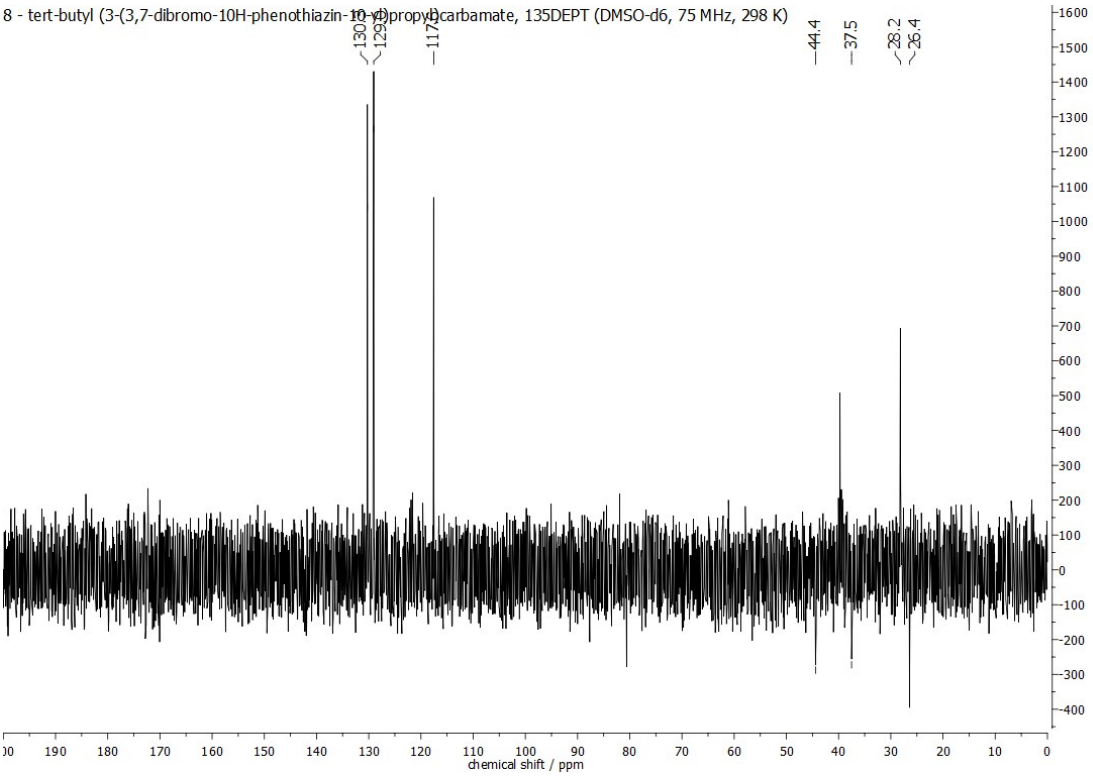
^{1}H NMR spectrum



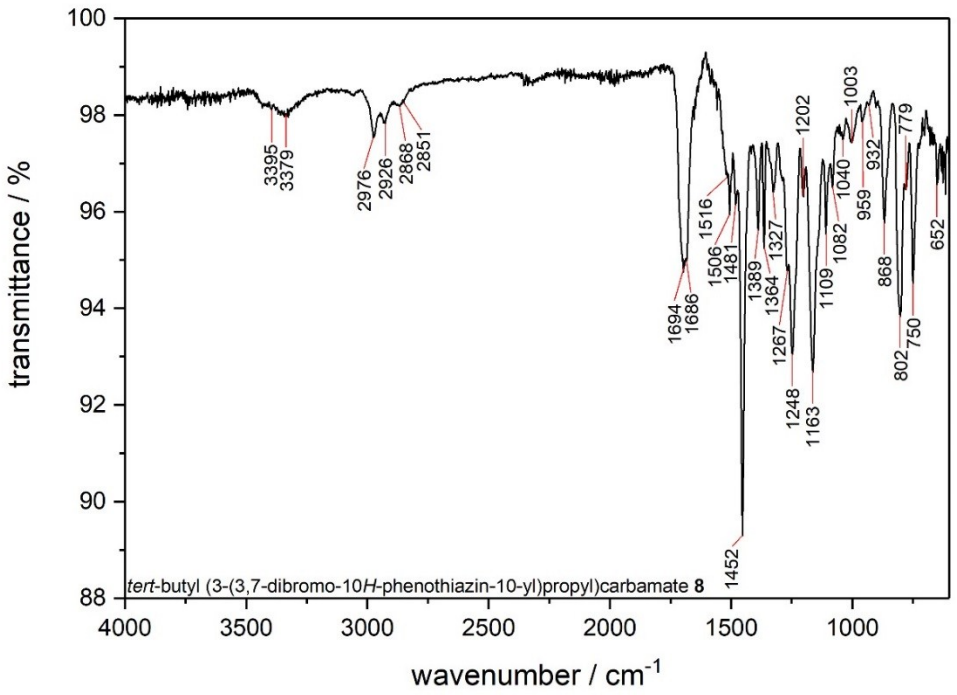
^{13}C NMR spectrum



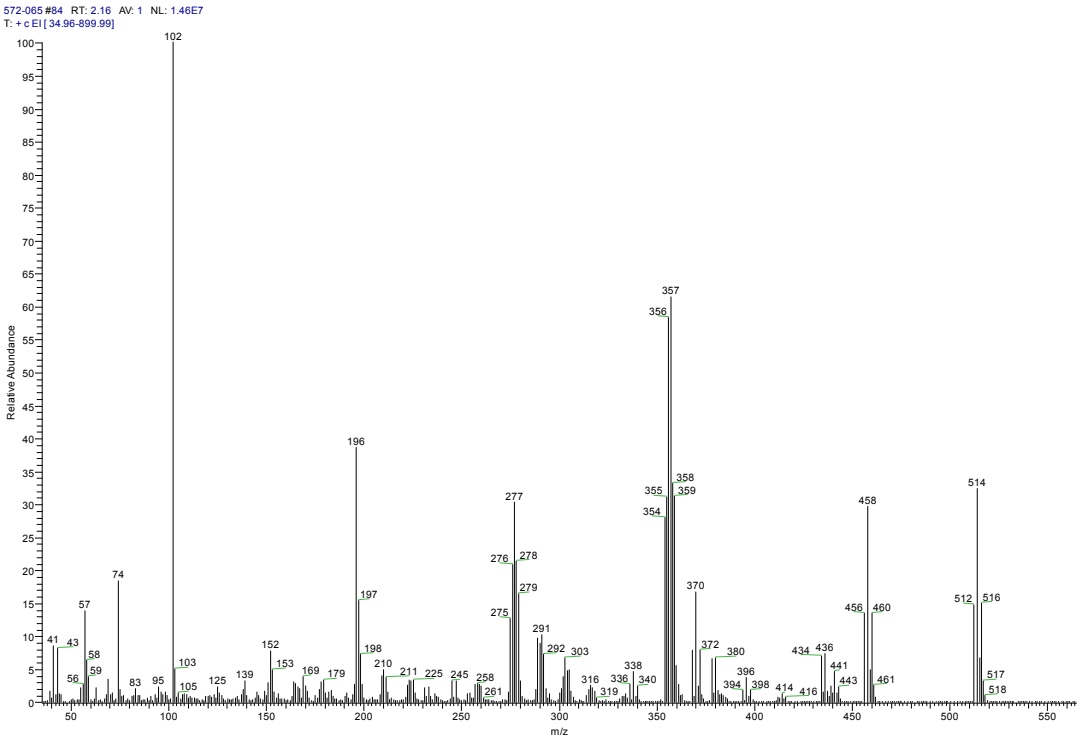
135DETP NMR spectrum



IR spectrum

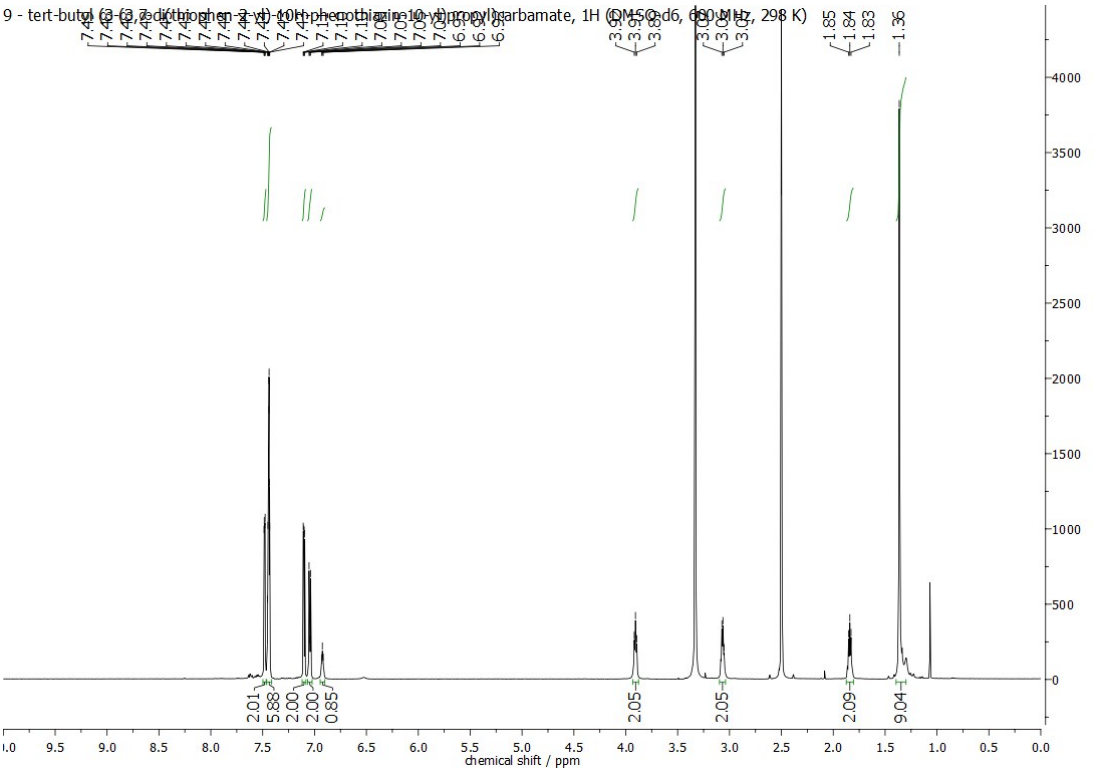


EI-MS spectrum

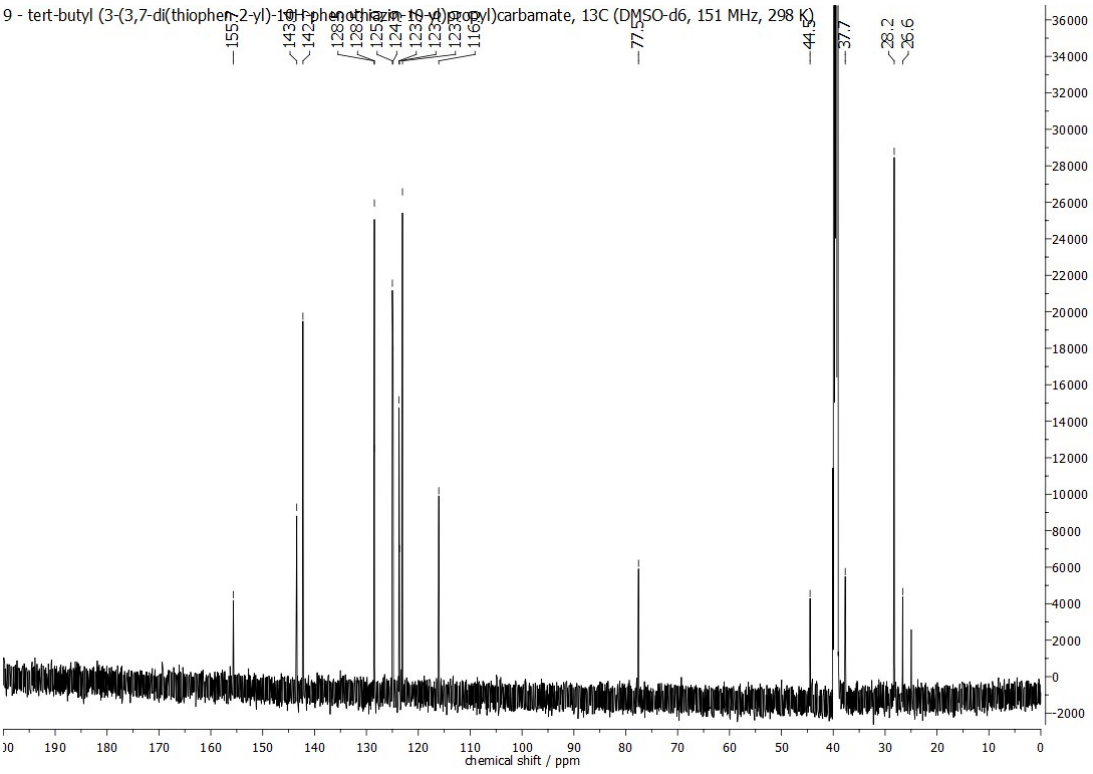


tert-Butyl(3-(3,7-di(thiophen-2-yl)-10*H*-phenothiazin-10-yl)propyl)carbamate (**9**)

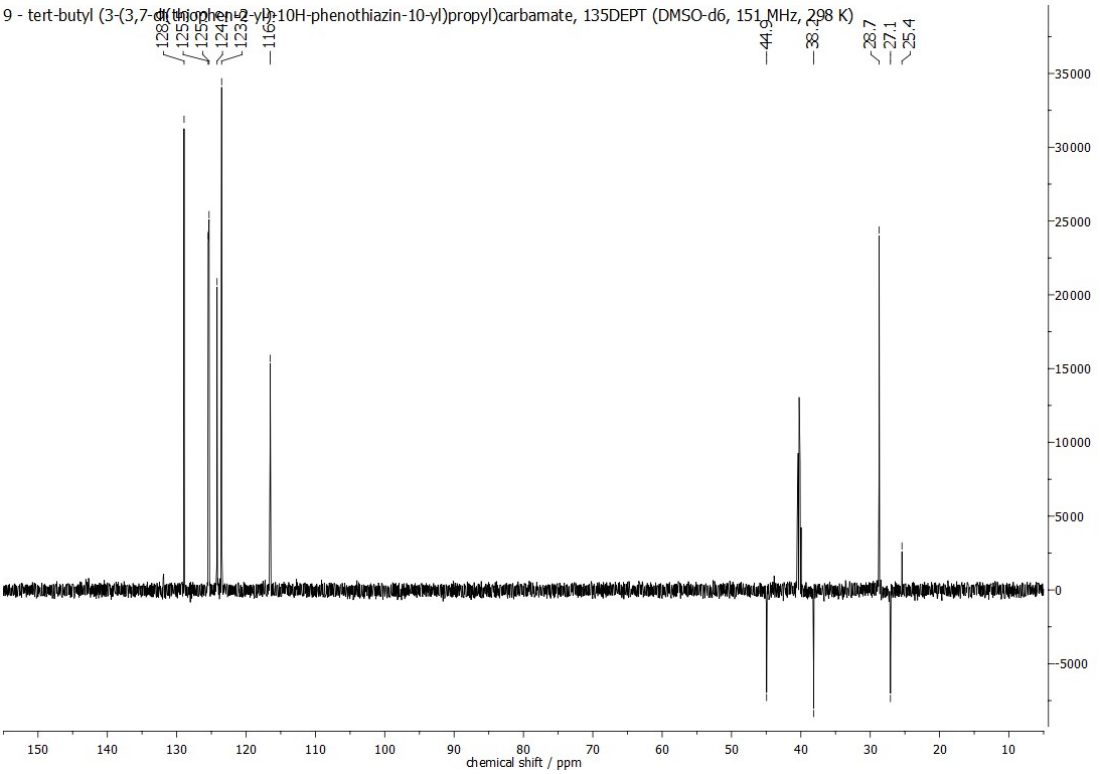
^{1}H NMR spectrum



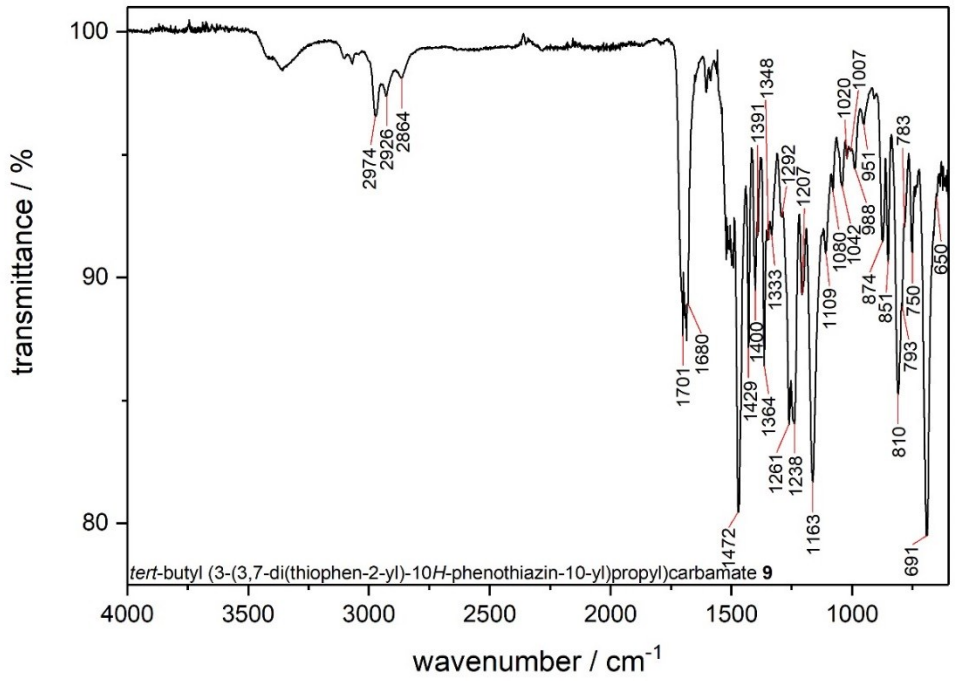
^{13}C NMR spectrum



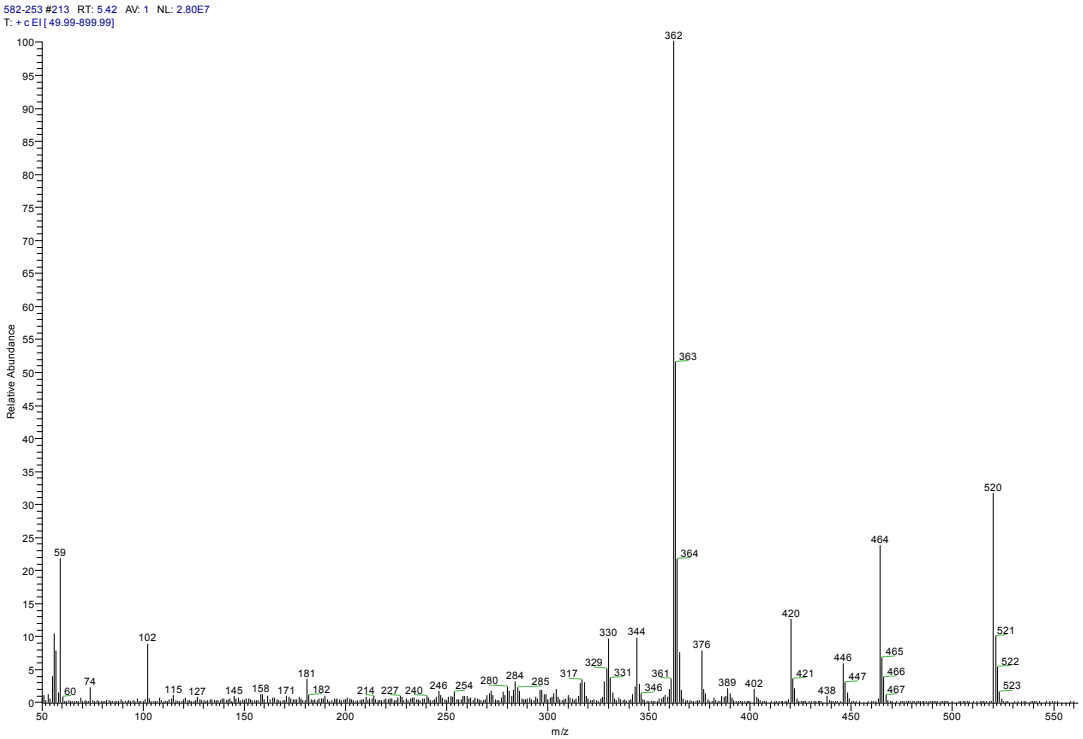
135DETP NMR spectrum



IR spectrum

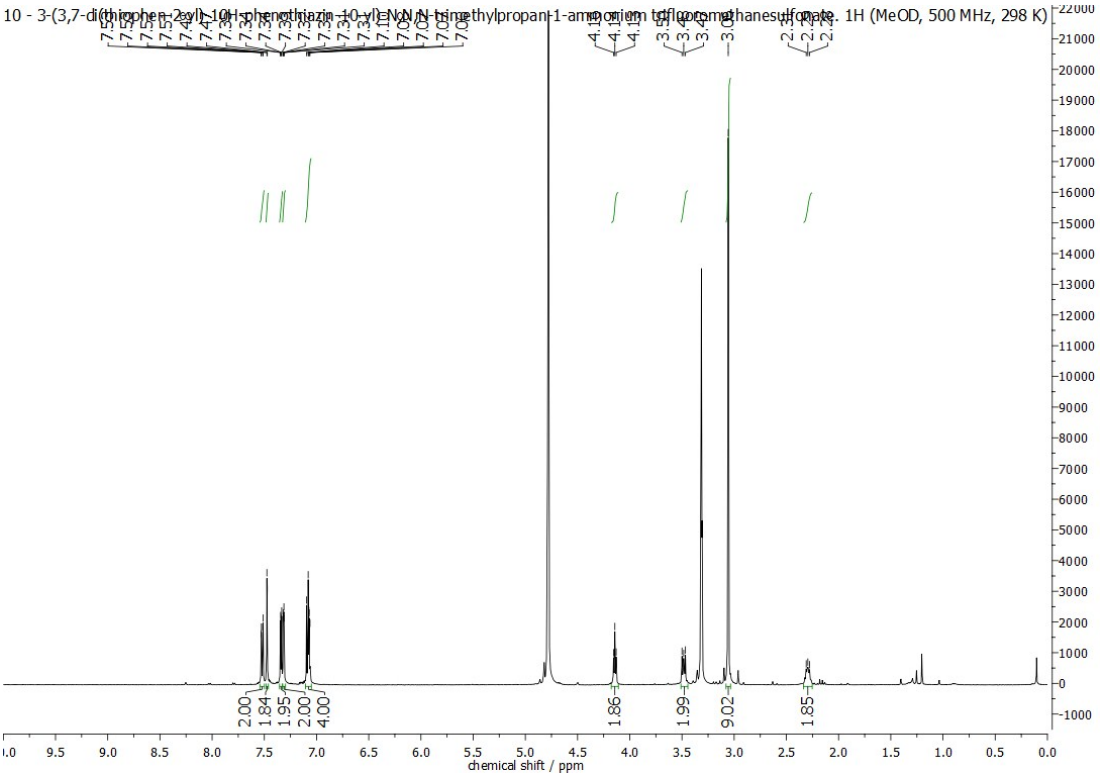


EI-MS spectrum

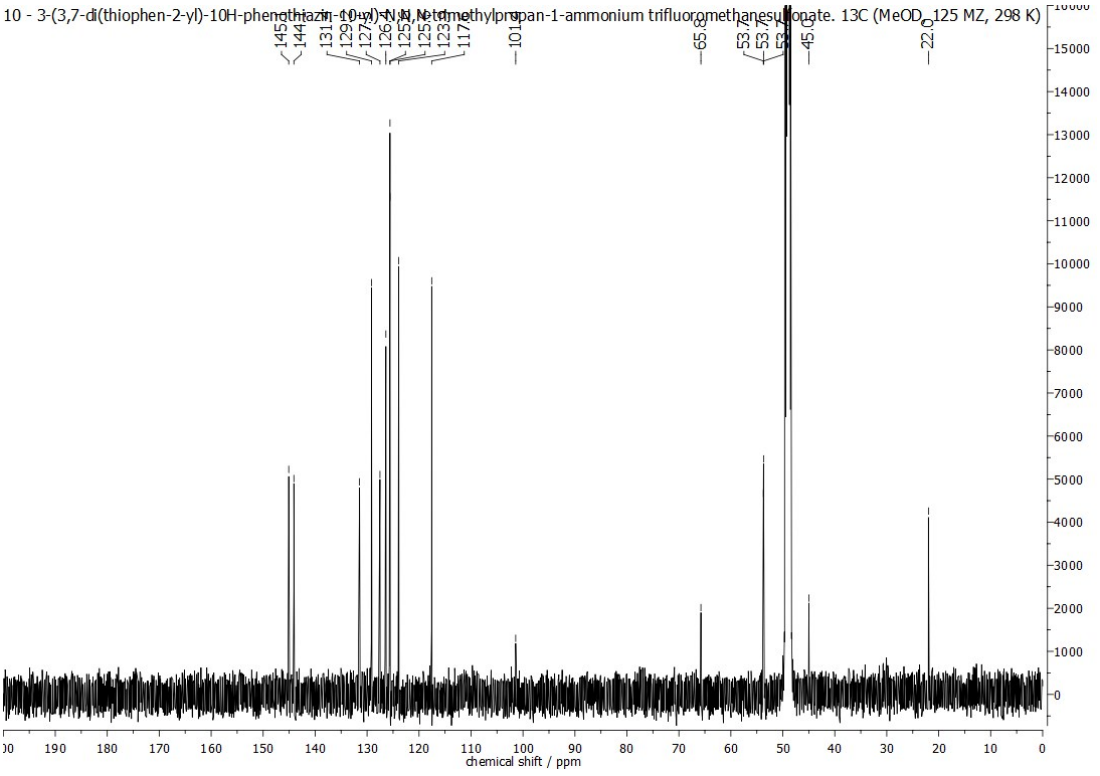


3-(3,7-Di(thiophen-2-yl)-10*H*-phenothiazin-10-yl)-*N*,*N*,*N*-trimethylpropan-1-ammonium trifluoromethanesulfonate (**10**)

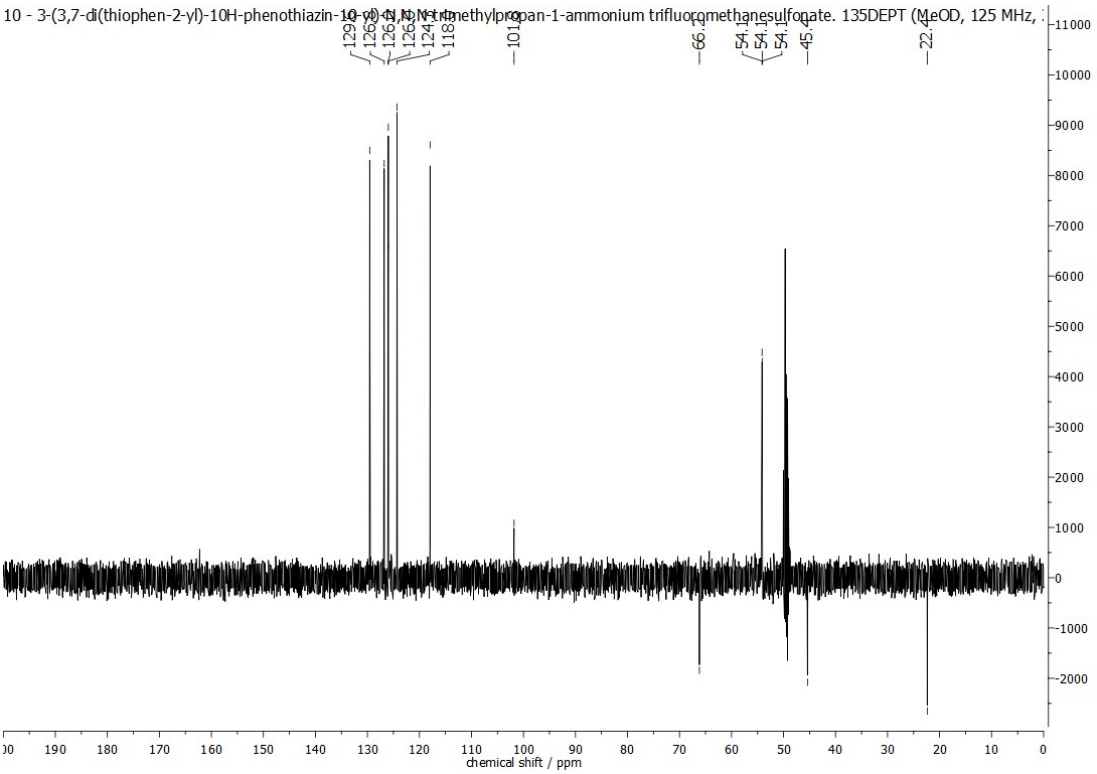
^{1}H NMR spectrum



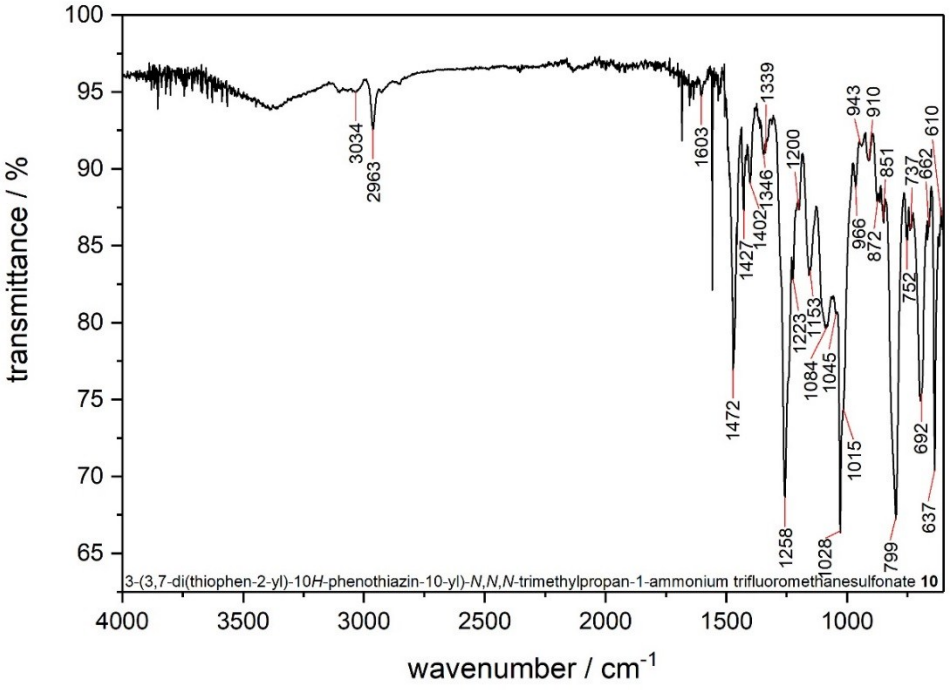
^{13}C NMR spectrum



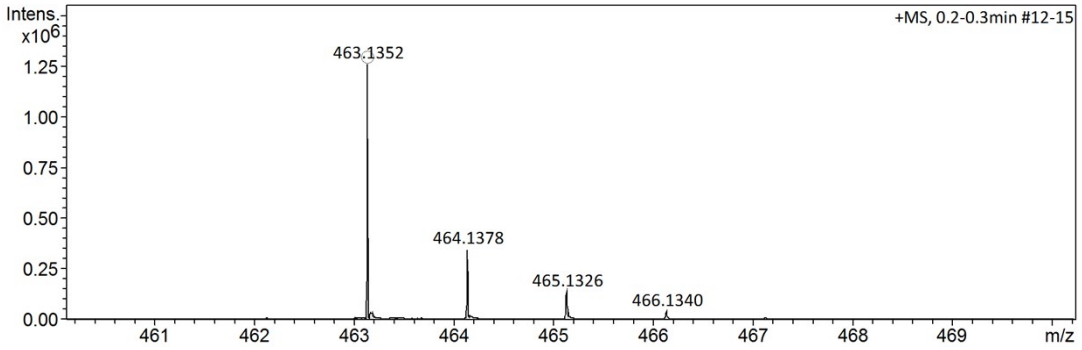
135DETP NMR spectrum



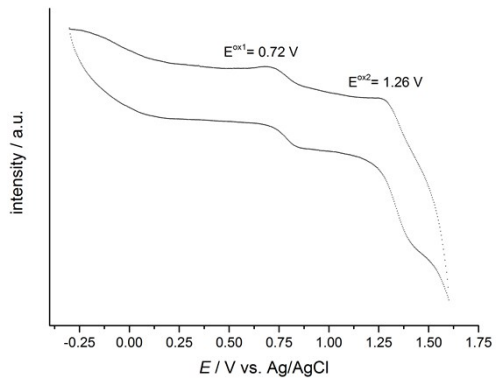
IR spectrum

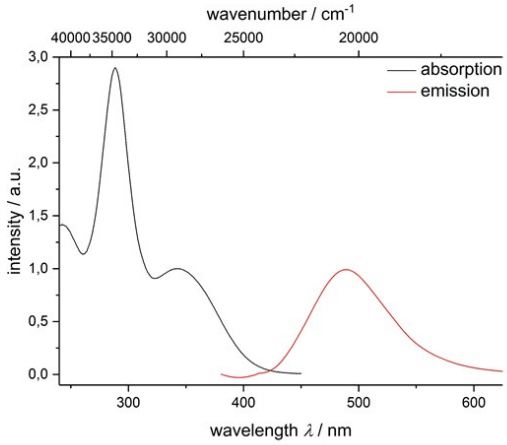


ESI-HRMS spectrum



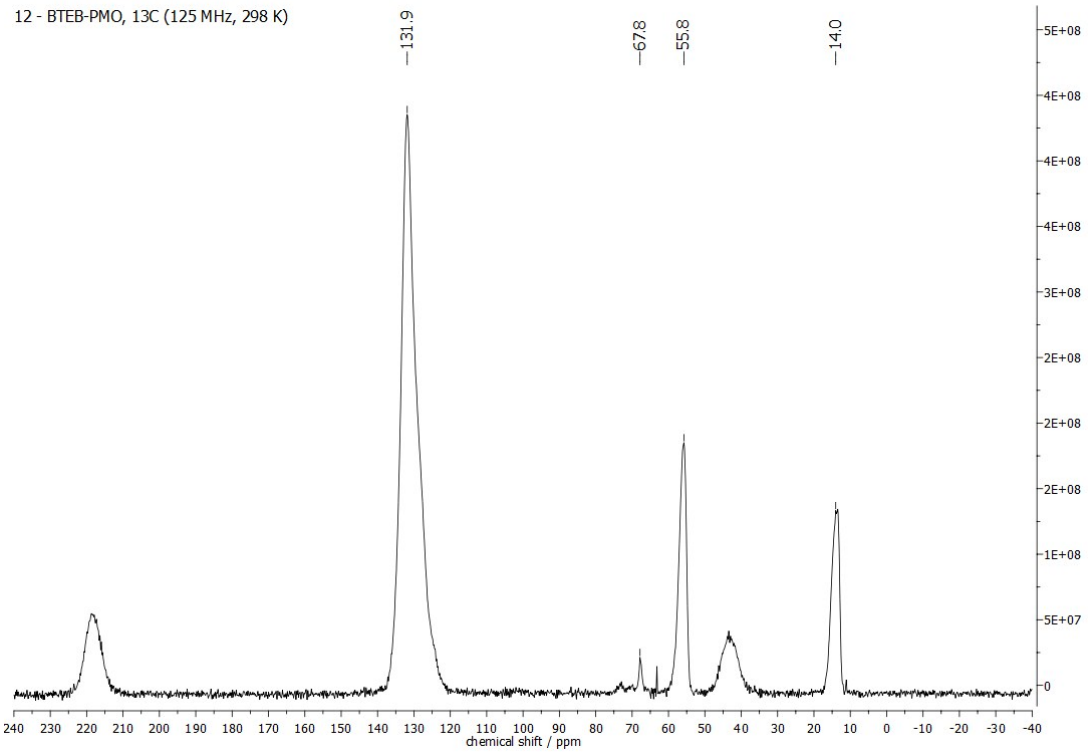
Cyclic voltammogram (left) and UV/Vis / fluorescence spectra (right) of **10**. CV: DCM, T = 20 °C, v = 100 mVs^{-1}, electrolyte: $(^nBu_4N)PF_6$, Pt working electrode, Pt counter electrode, Ag/AgCl reference electrode; UV/Vis: DCM, T = 20 °C, $^1\Delta\tilde{\nu} = 1/\lambda_{max,abs} - 1/\lambda_{max,em}$.



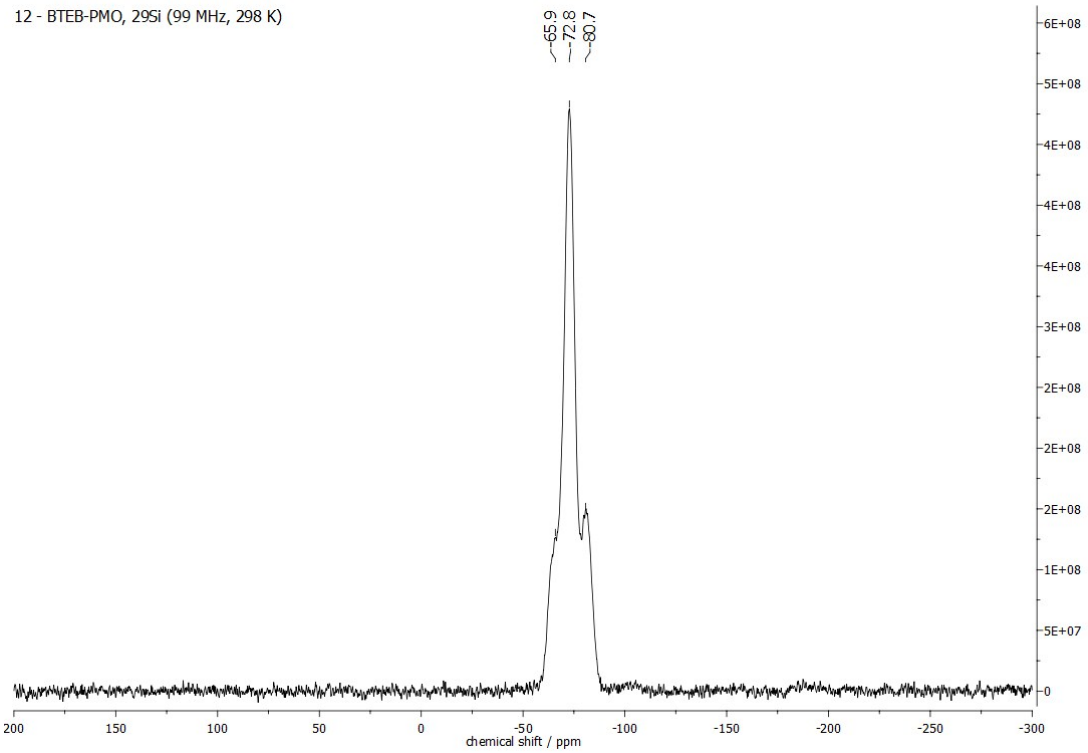


BTEB-PMO (**12**)

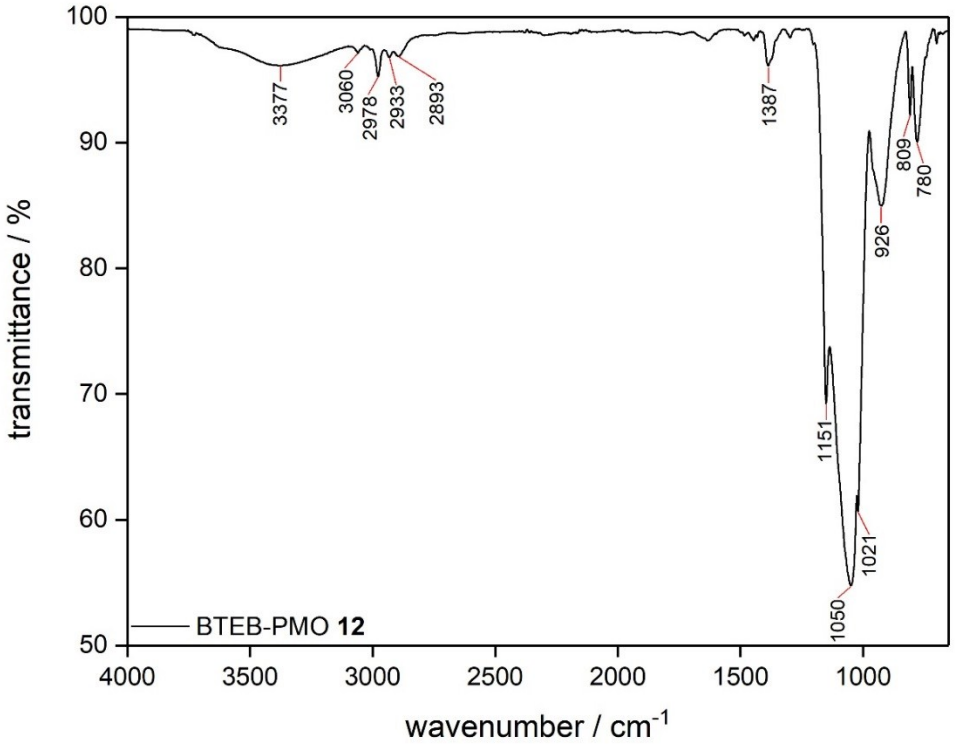
Solid state CP-MAS ^{13}C NMR spectrum



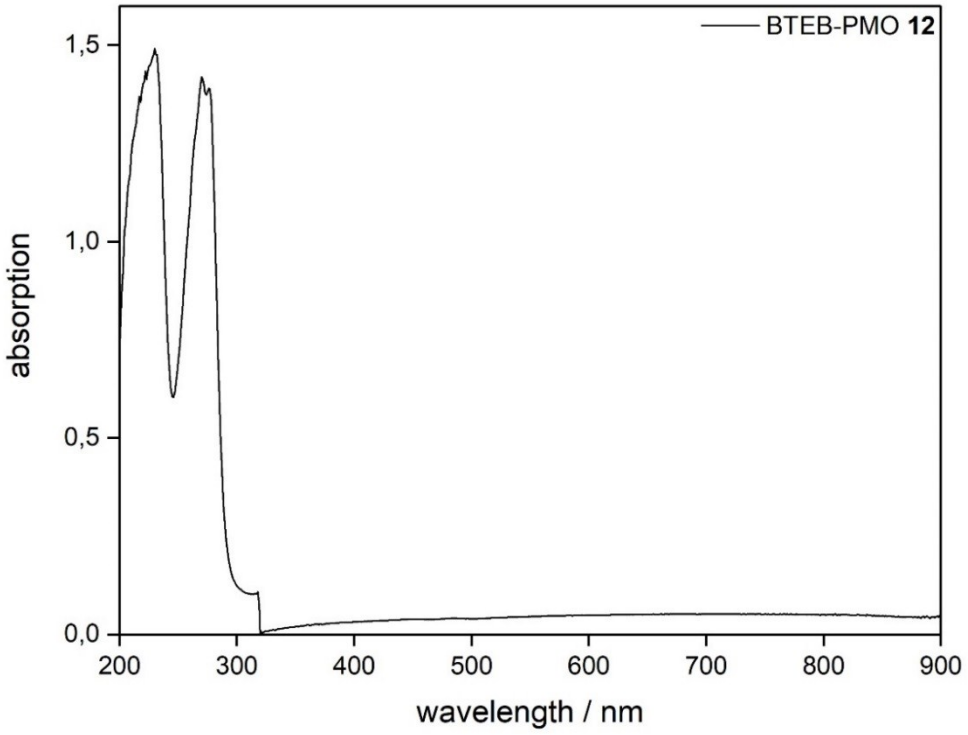
Solid state CP-MAS ^{29}Si NMR spectrum



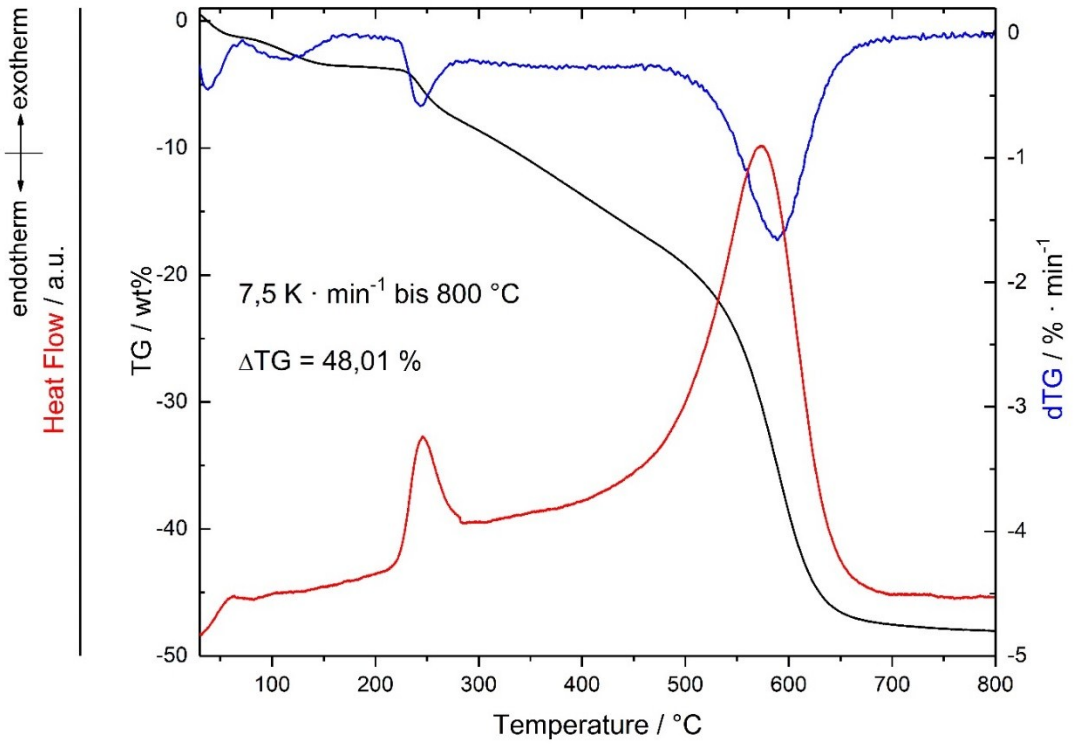
IR spectrum



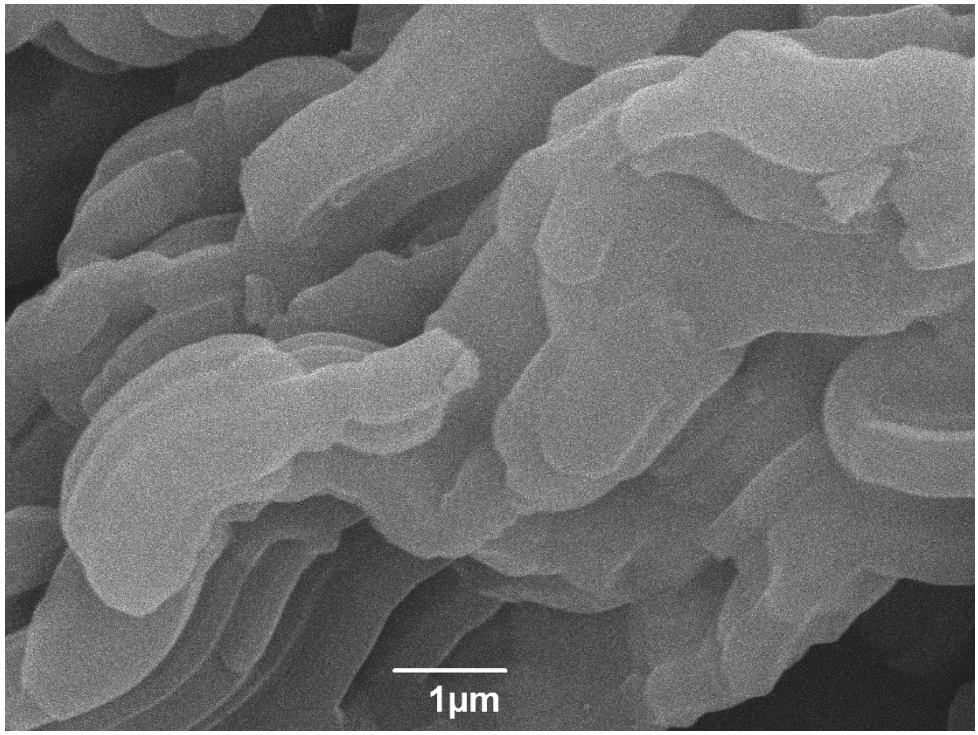
UV/Vis spectrum



TGA

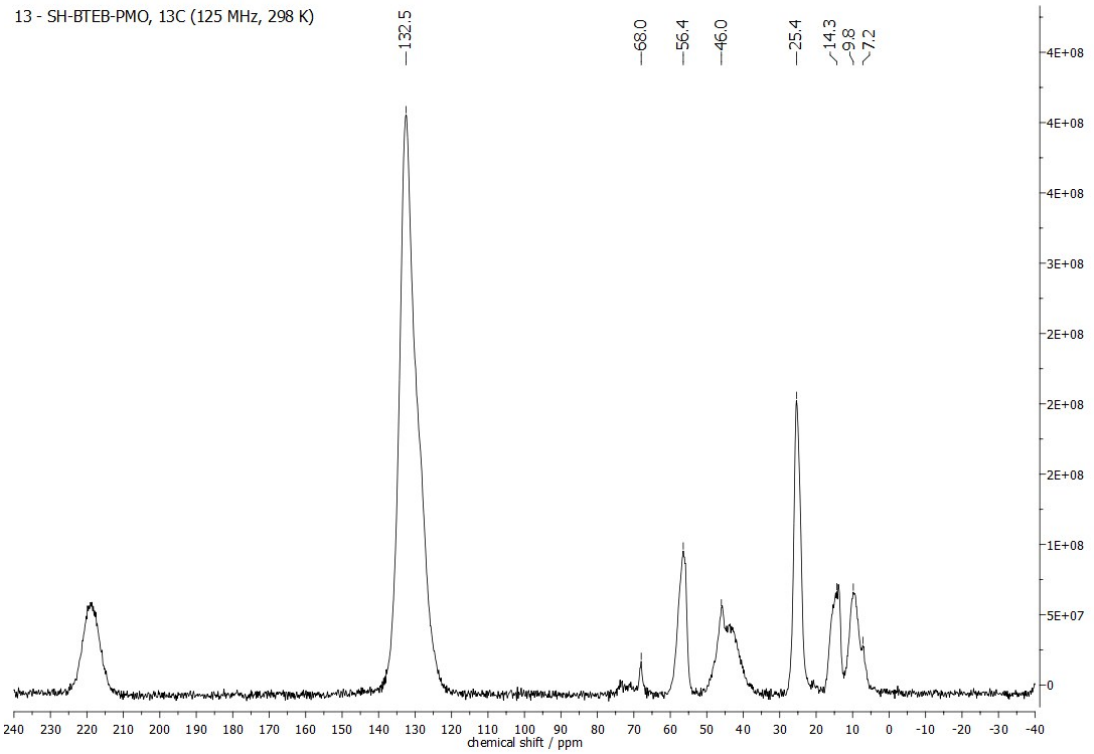

exotherm
endotherm
Heat Flow / a.u.
TG / wt%
dTG / % · min-1
7,5 K · min-1 bis 800 °C
ΔTG = 48,01 %
Temperature / °C
0
-10
-20
-30
-40
-50
-1
-2
-3
-4
-5
100
200
300
400
500
600
700
800

SEM

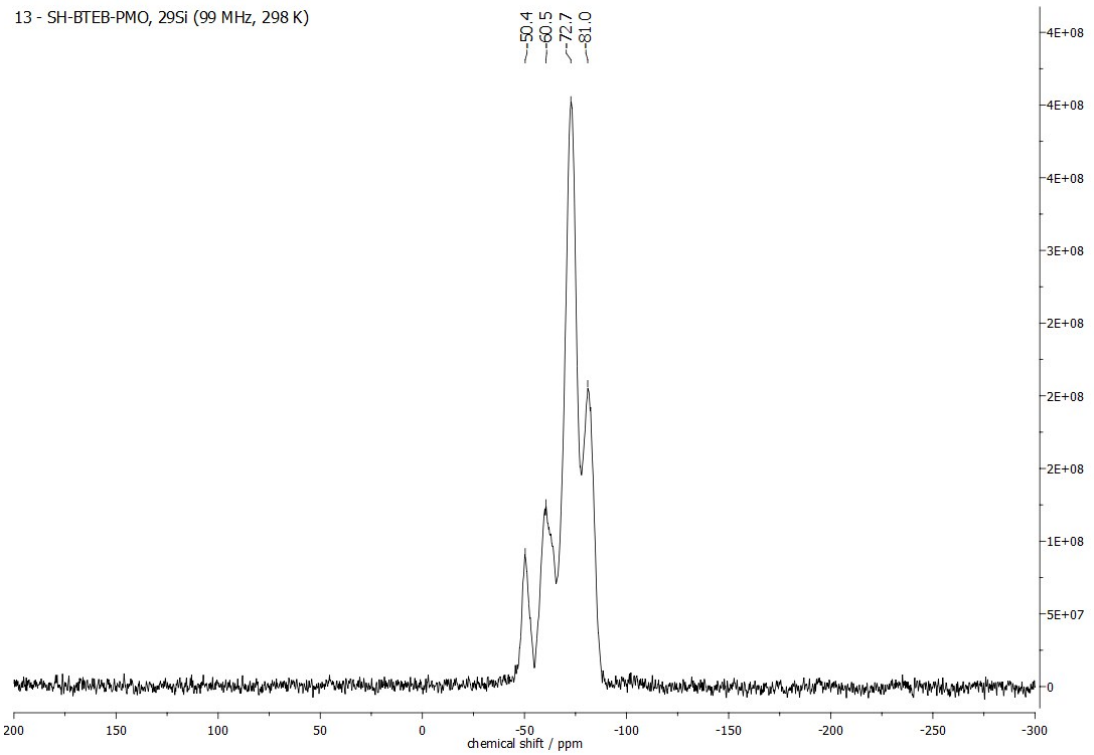

1µm

SH-BTEB-PMO (**13**)

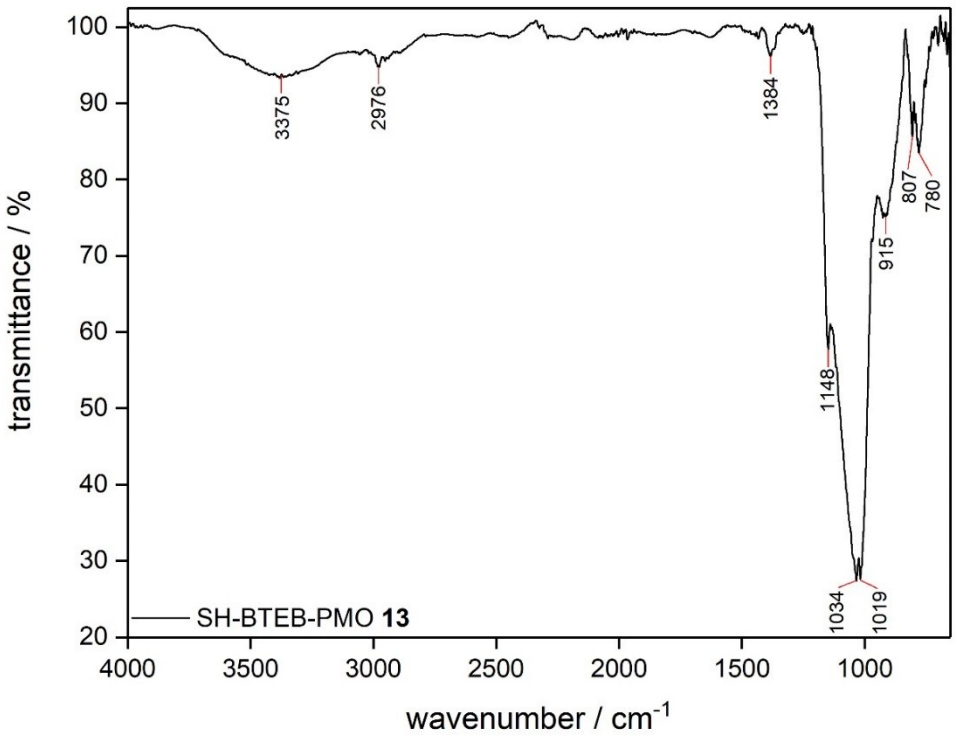
Solid state CP-MAS ^{13}C NMR spectrum



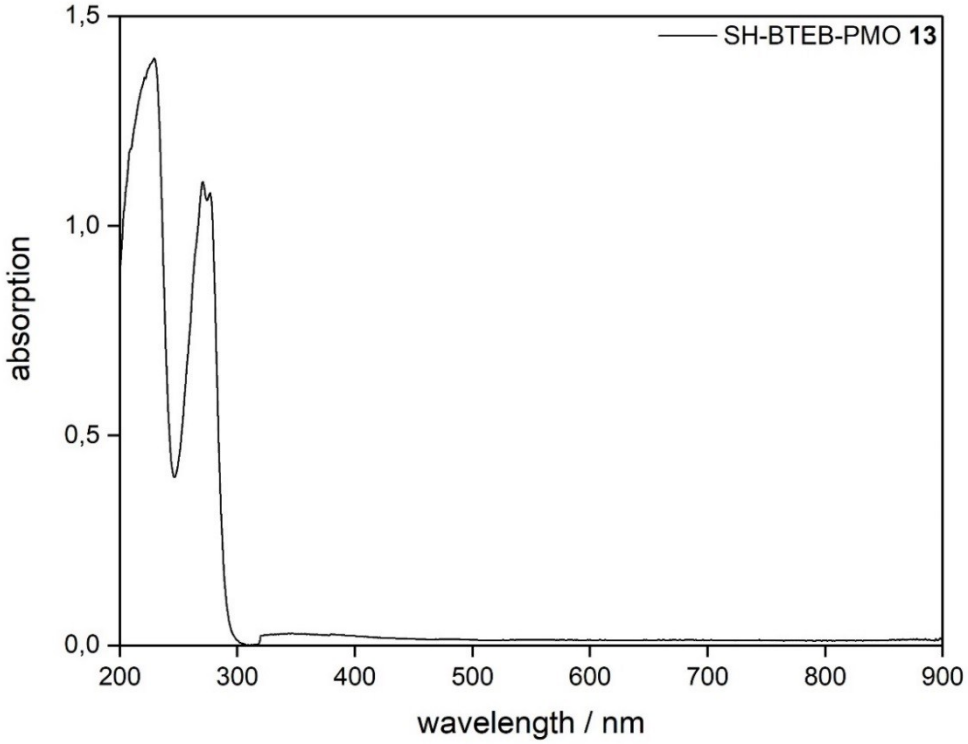
Solid state CP-MAS ^{29}Si NMR spectrum



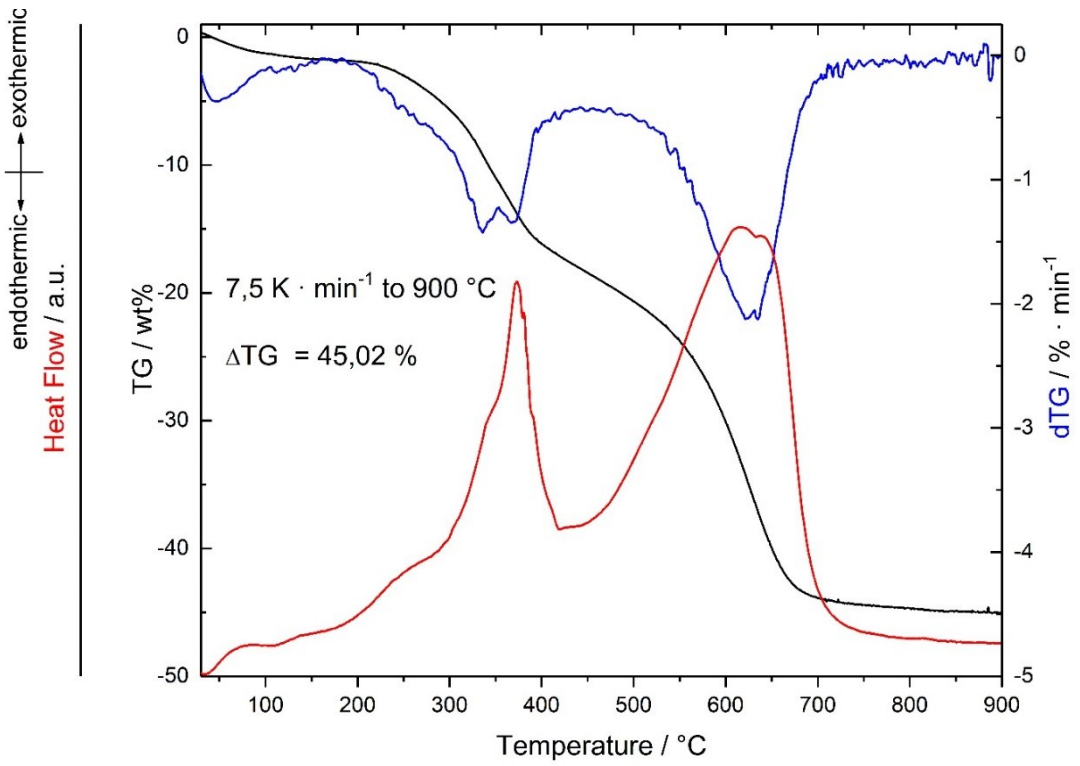
IR spectrum



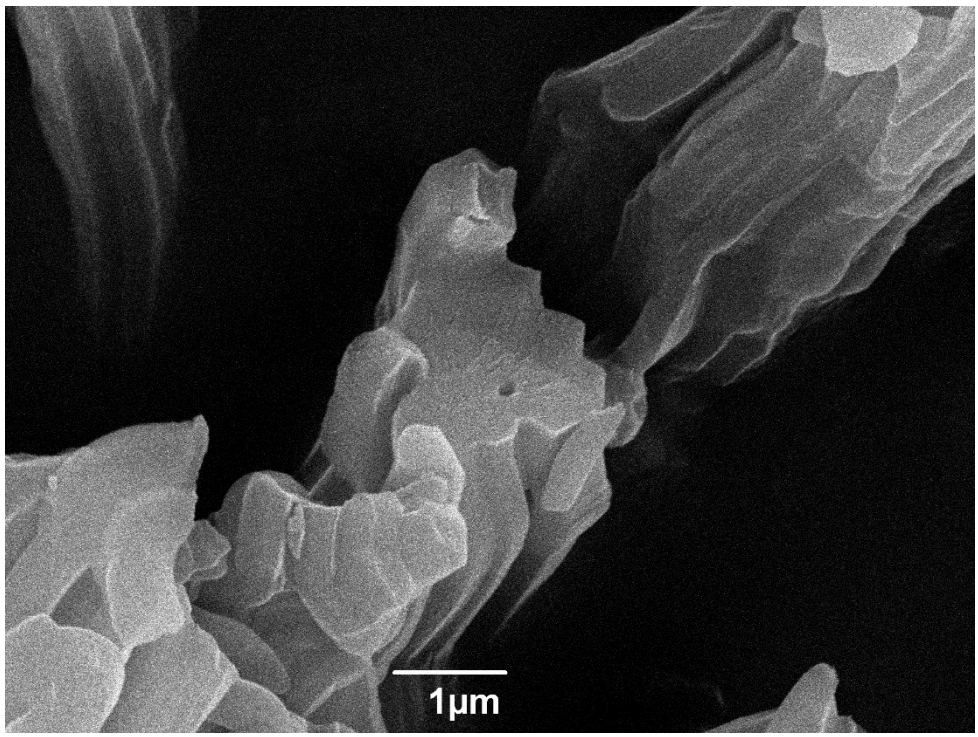
UV/Vis spectrum



TGA

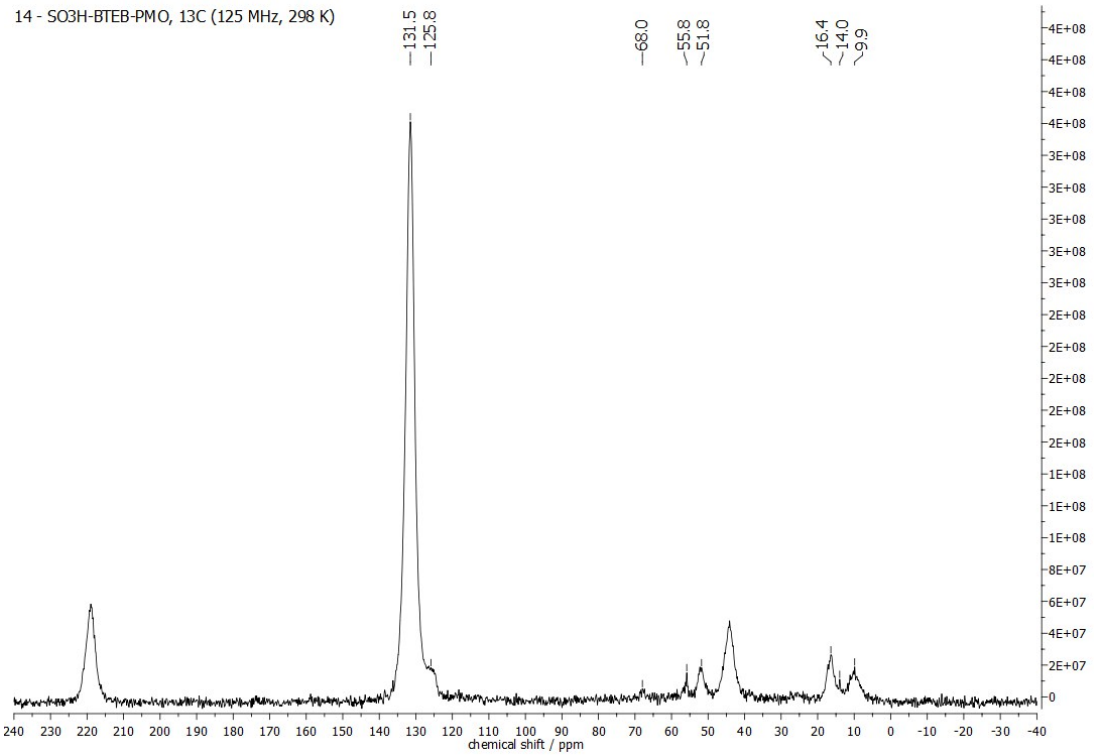

endothermic
exothermic
Heat Flow / a.u.
TG / wt%
dTG / % · min-1
7,5 K · min-1 to 900 °C
ΔTG = 45,02 %
Temperature / °C
0
-10
-20
-30
-40
-50
-1
-2
-3
-4
-5
100
200
300
400
500
600
700
800
900

SEM

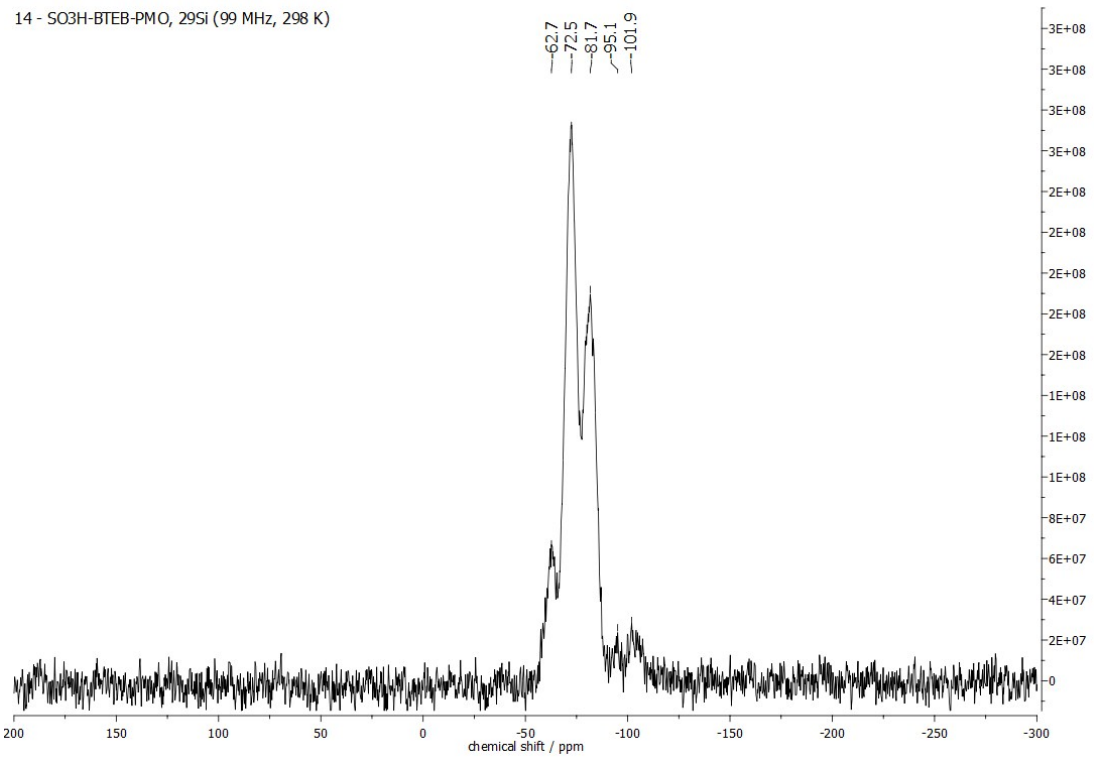

1µm

SO_3H-BTEB-PMO (**14**)

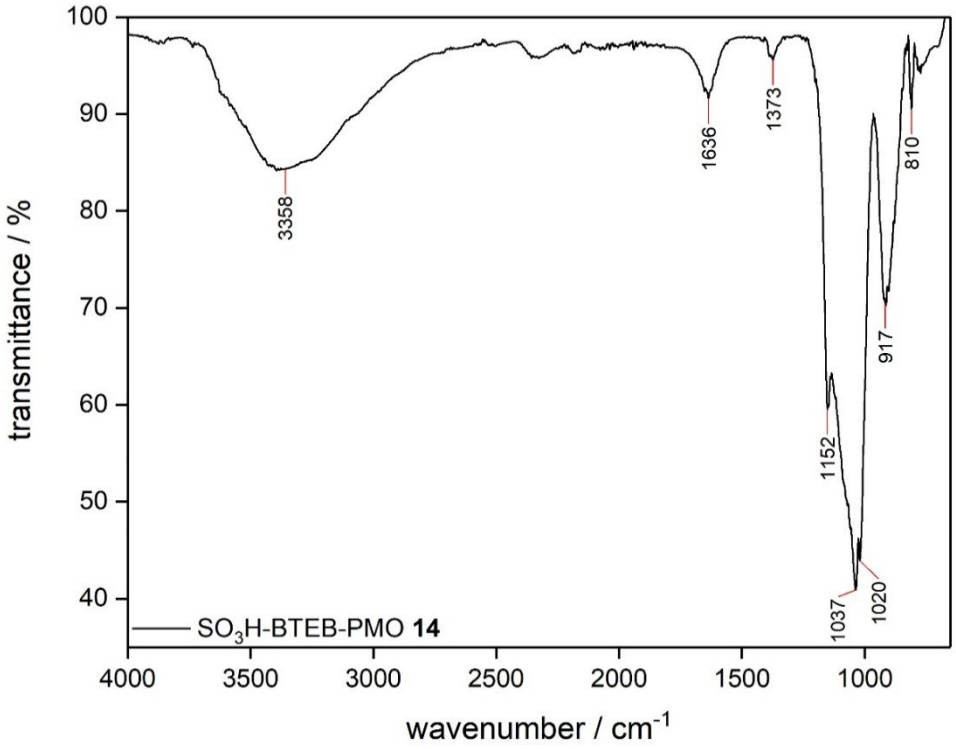
Solid state CP-MAS ^{13}C NMR spectrum



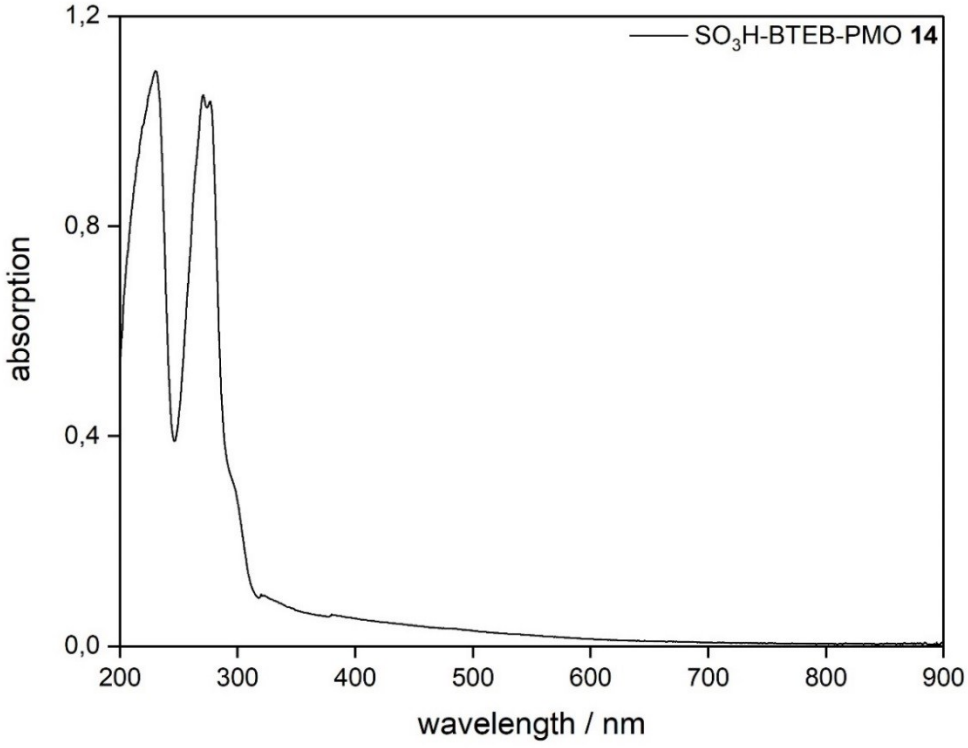
Solid state CP-MAS ^{29}Si NMR spectrum



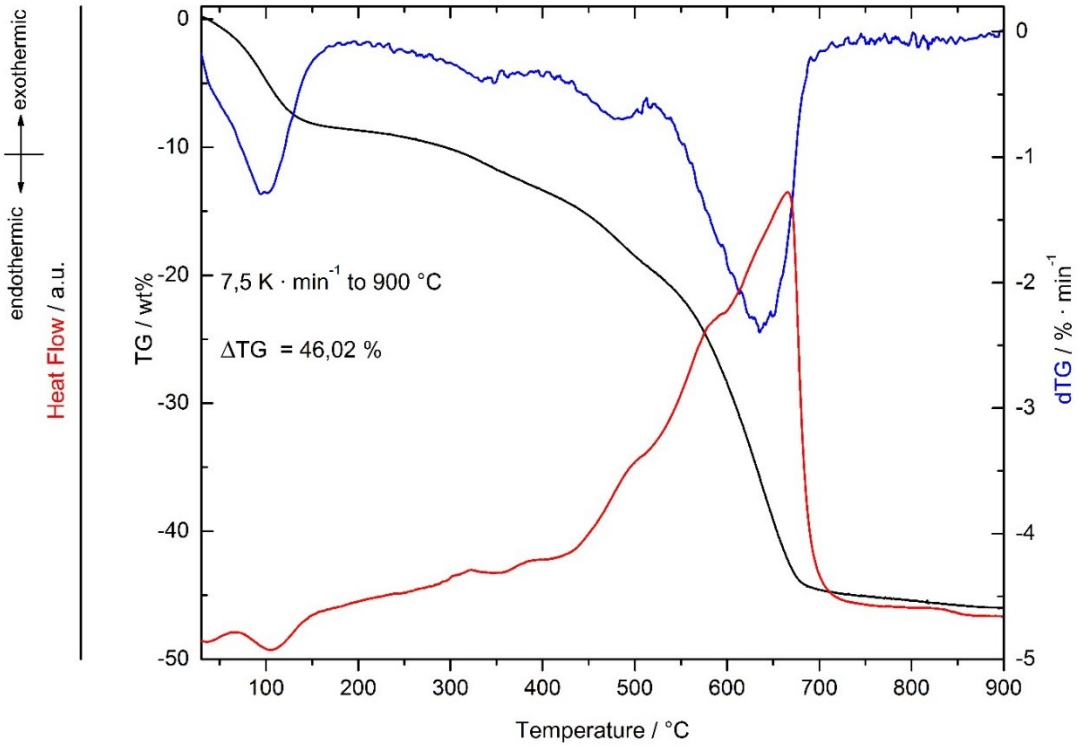
IR spectrum



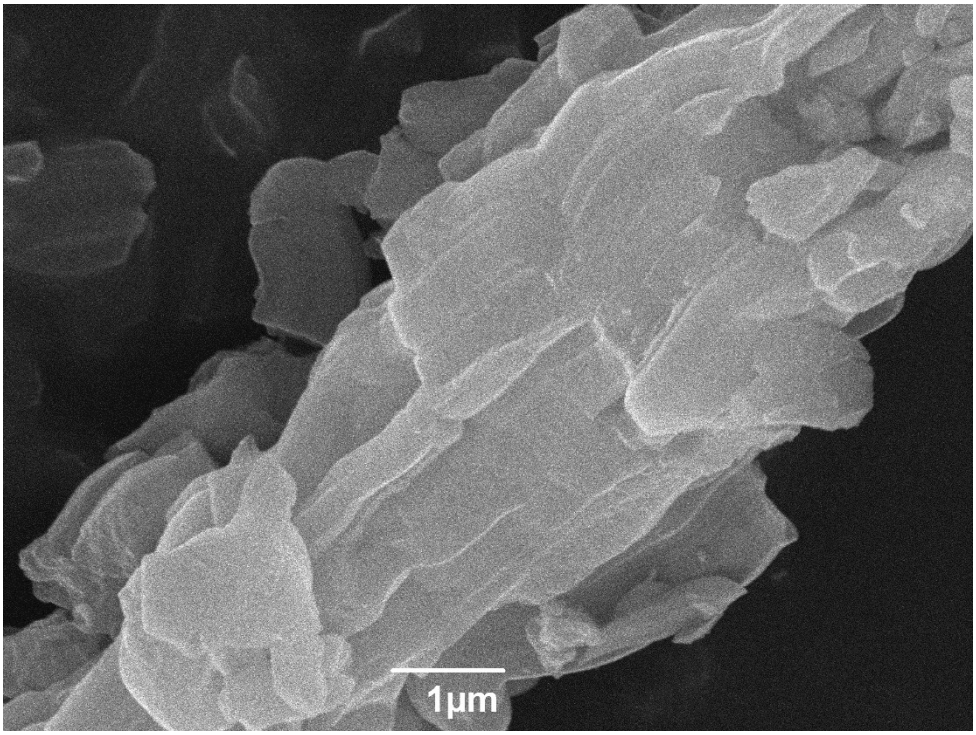
UV/Vis spectrum



TGA

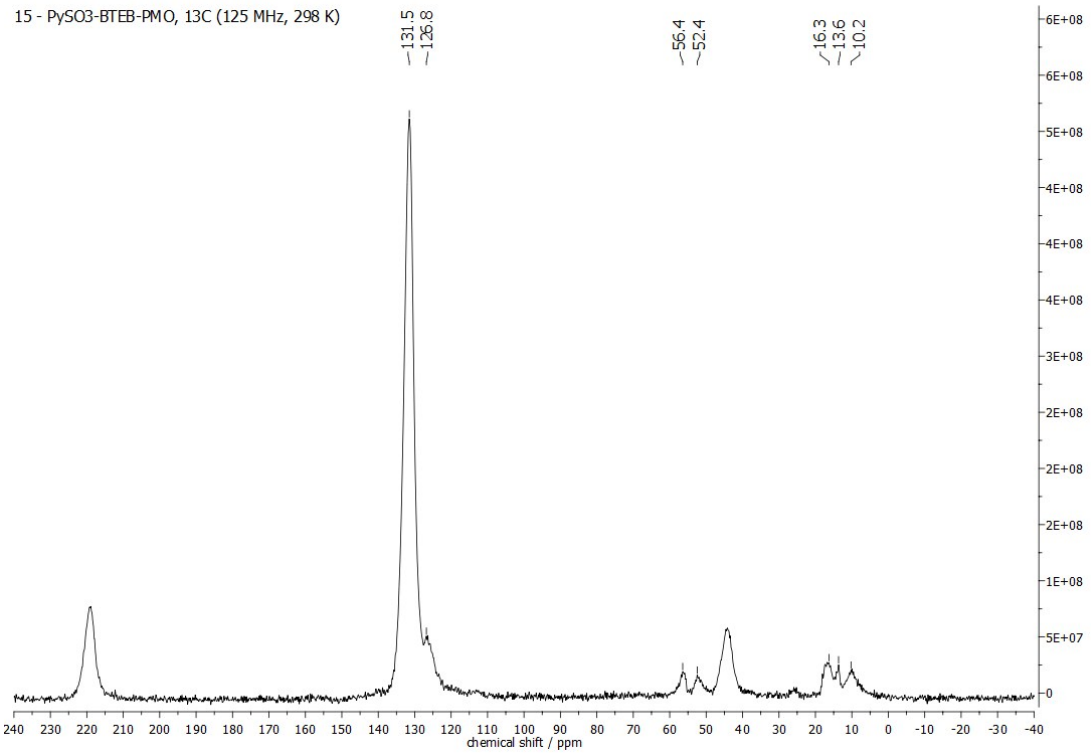

exothermic
endothermic
Heat Flow / a.u.
TG / wt%
dTG / % · min-1
7,5 K · min-1 to 900 °C
ΔTG = 46,02 %
Temperature / °C
0
-10
-20
-30
-40
-50
-1
-2
-3
-4
-5
100
200
300
400
500
600
700
800
900

SEM

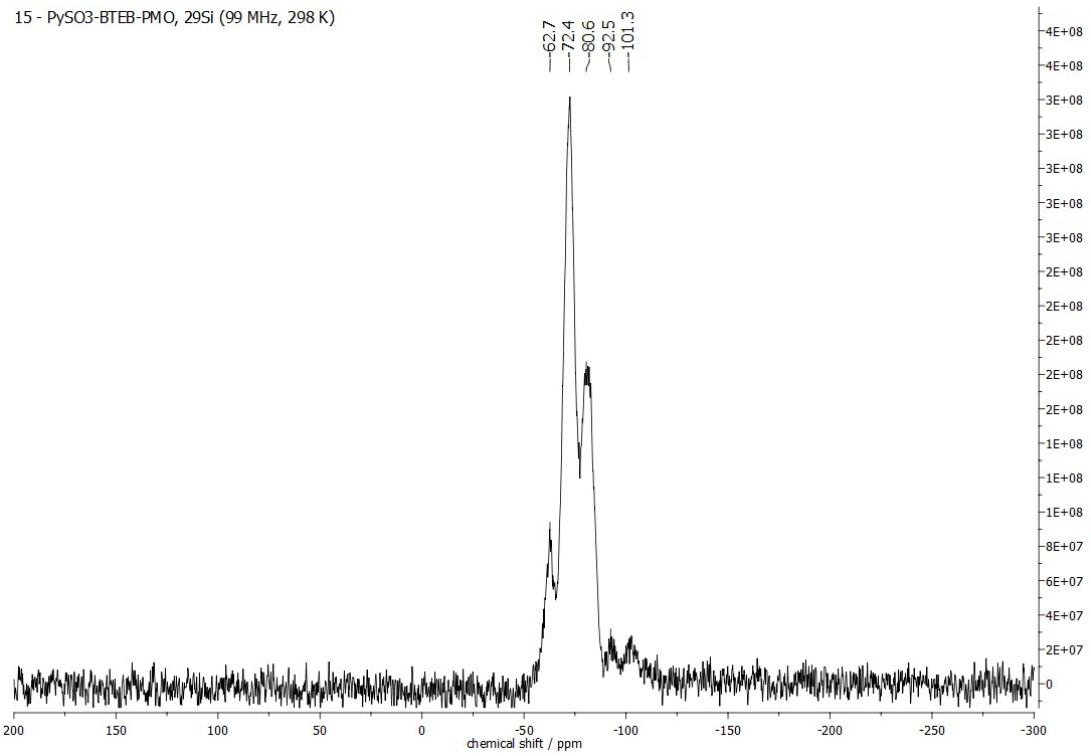

1µm

$PySO_3$-BTEB-PMO (**15**)

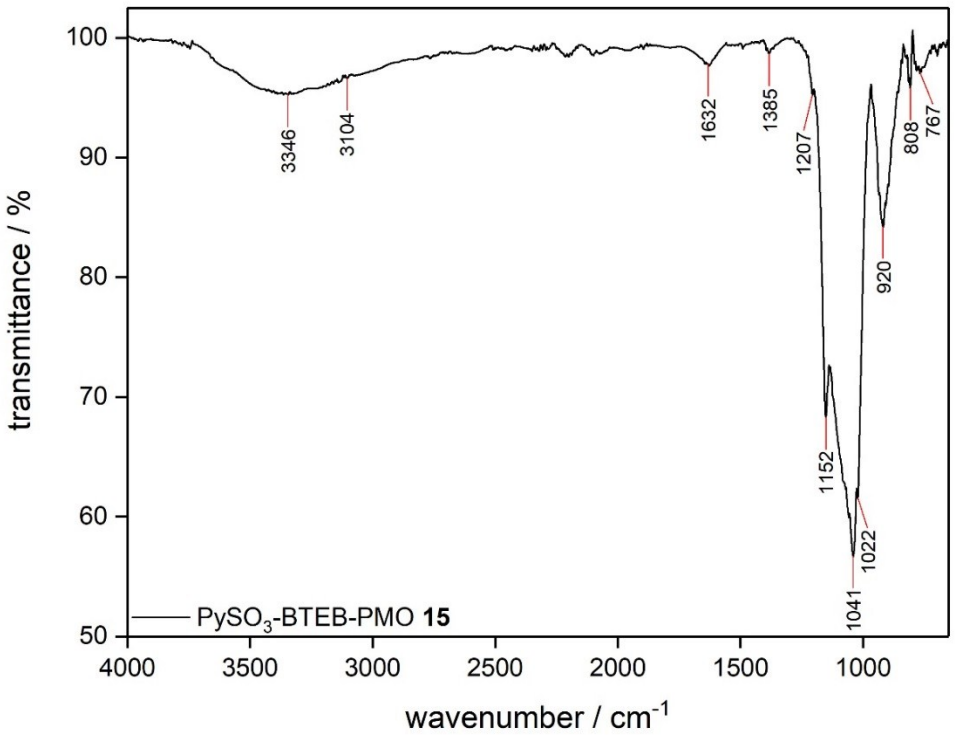
Solid state CP-MAS ^{13}C NMR spectrum



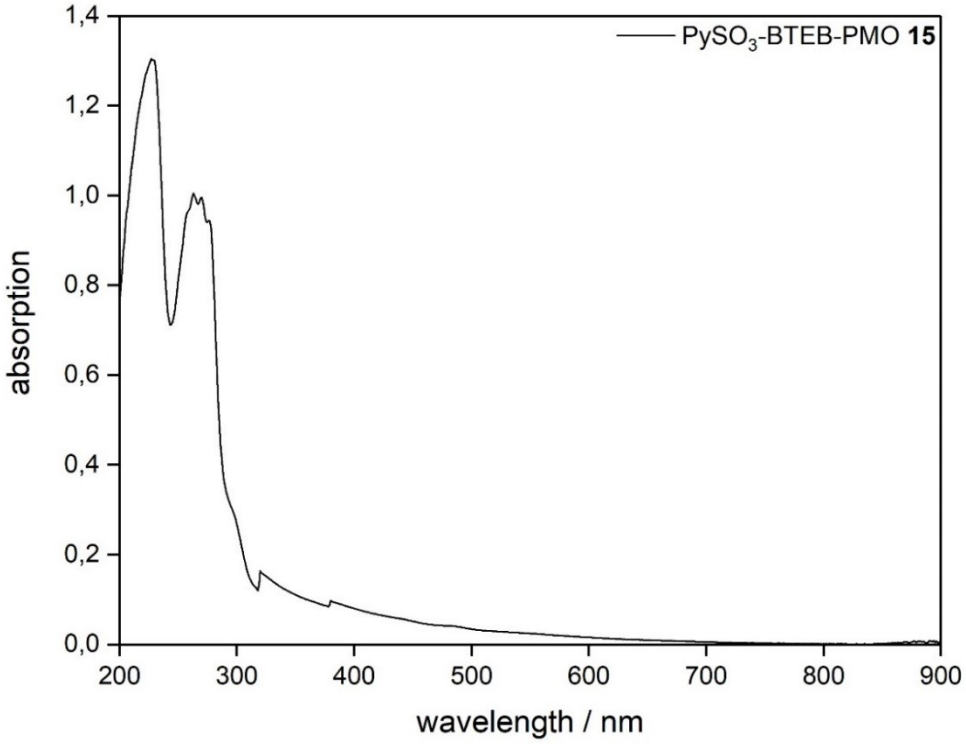
Solid state CP-MAS ^{29}Si NMR spectrum



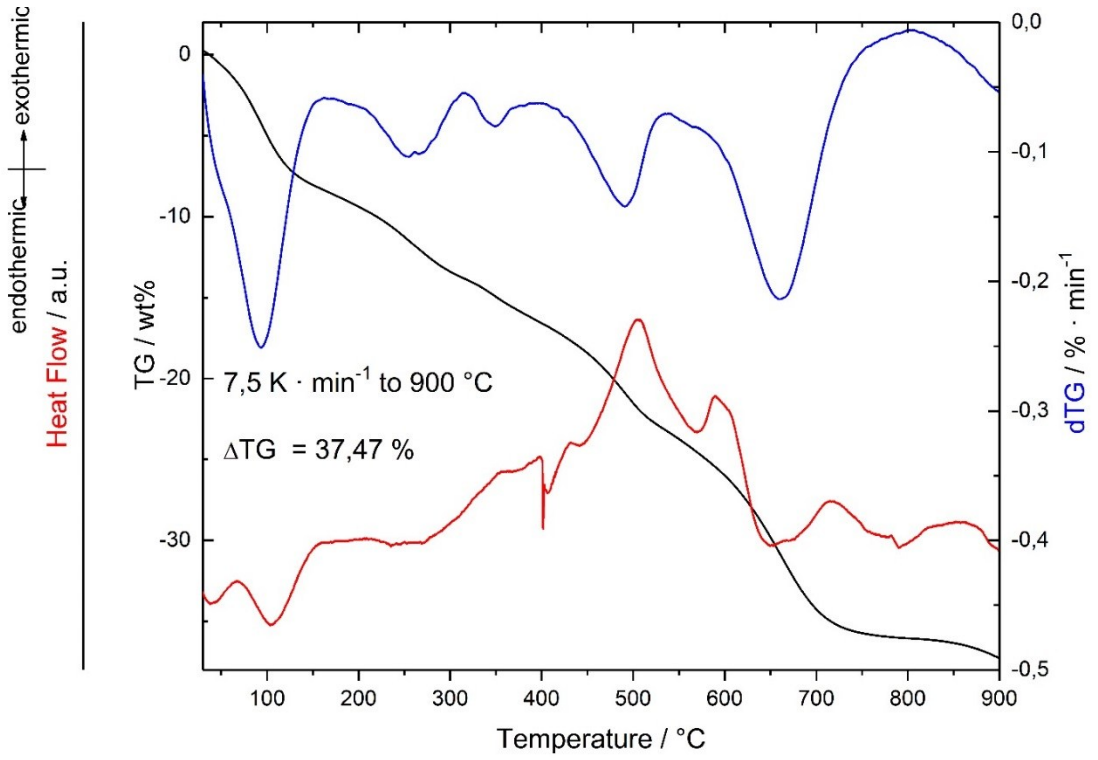
IR spectrum



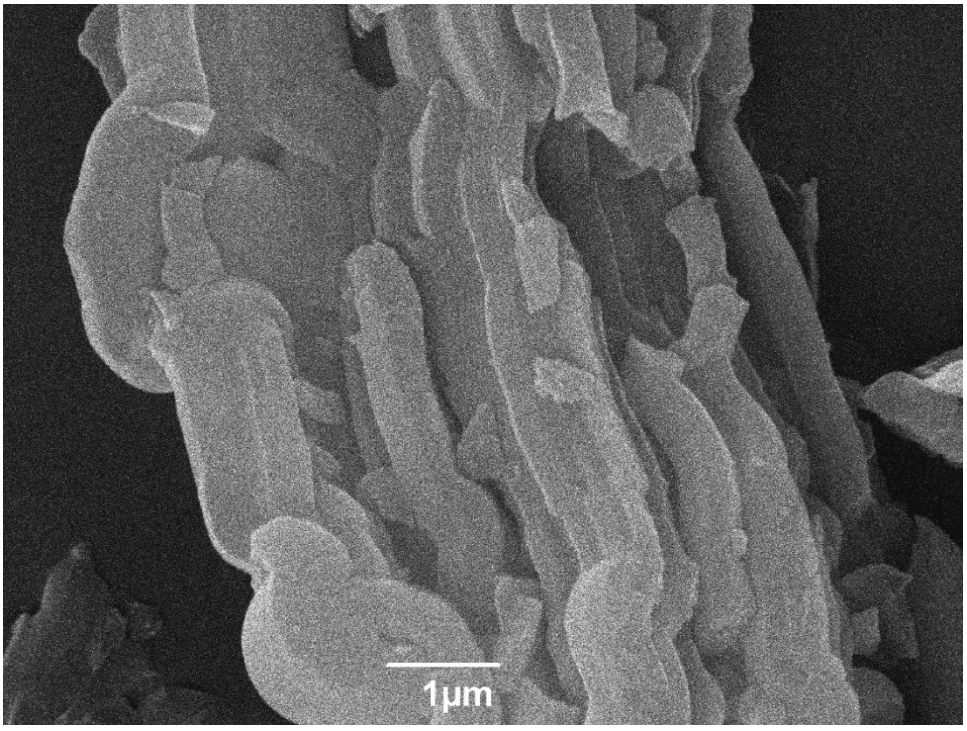
UV/Vis spectrum



TGA

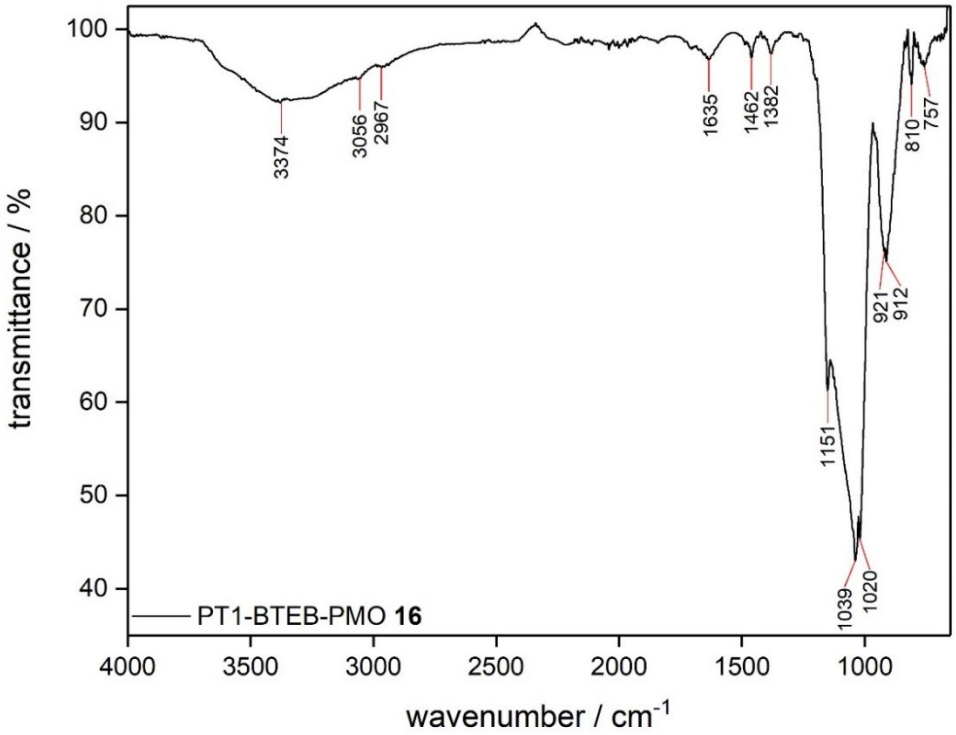

endothermic
exothermic
Heat Flow / a.u.
TG / wt%
dTG / % · min-1
7,5 K · min-1 to 900 °C
ΔTG = 37,47 %
Temperature / °C
0
-10
-20
-30
0,0
-0,1
-0,2
-0,3
-0,4
-0,5
100
200
300
400
500
600
700
800
900

SEM

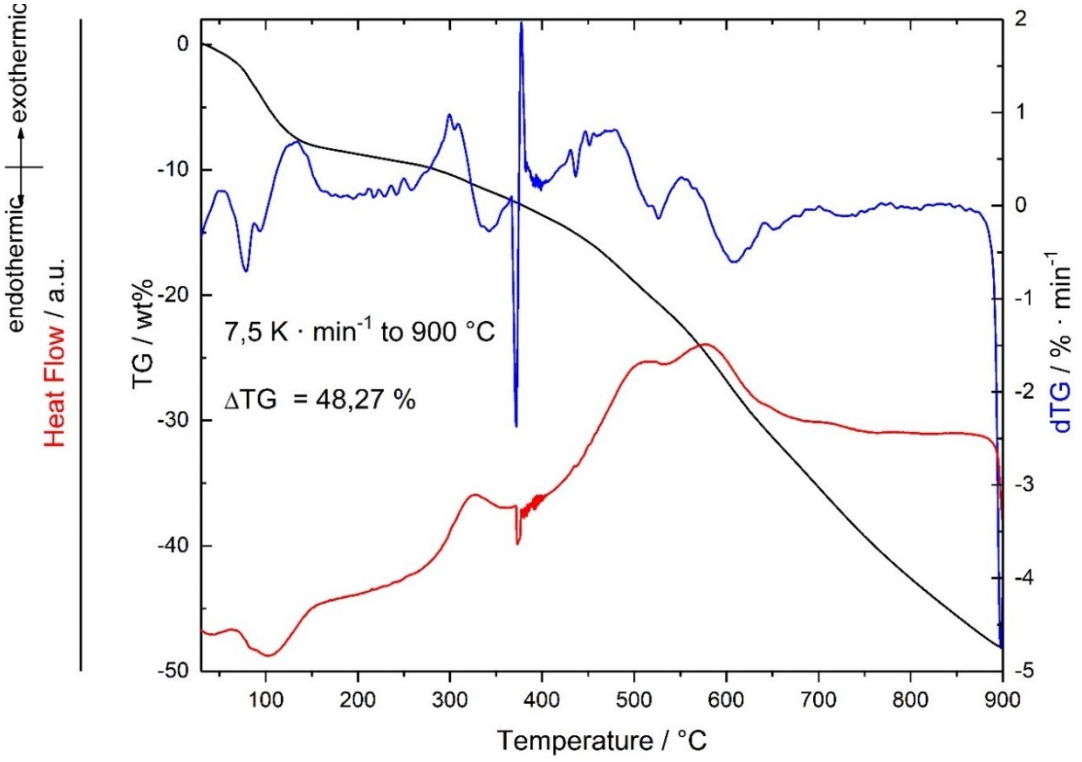

1µm

PT1-BTEB-PMO (**16**)

IR spectrum

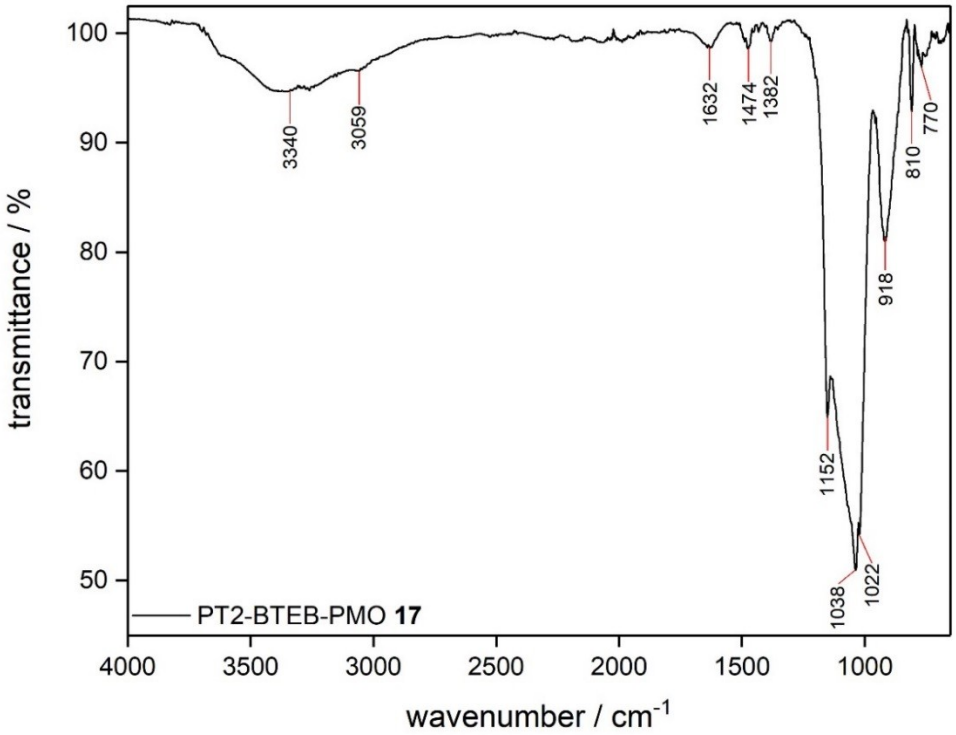


TGA

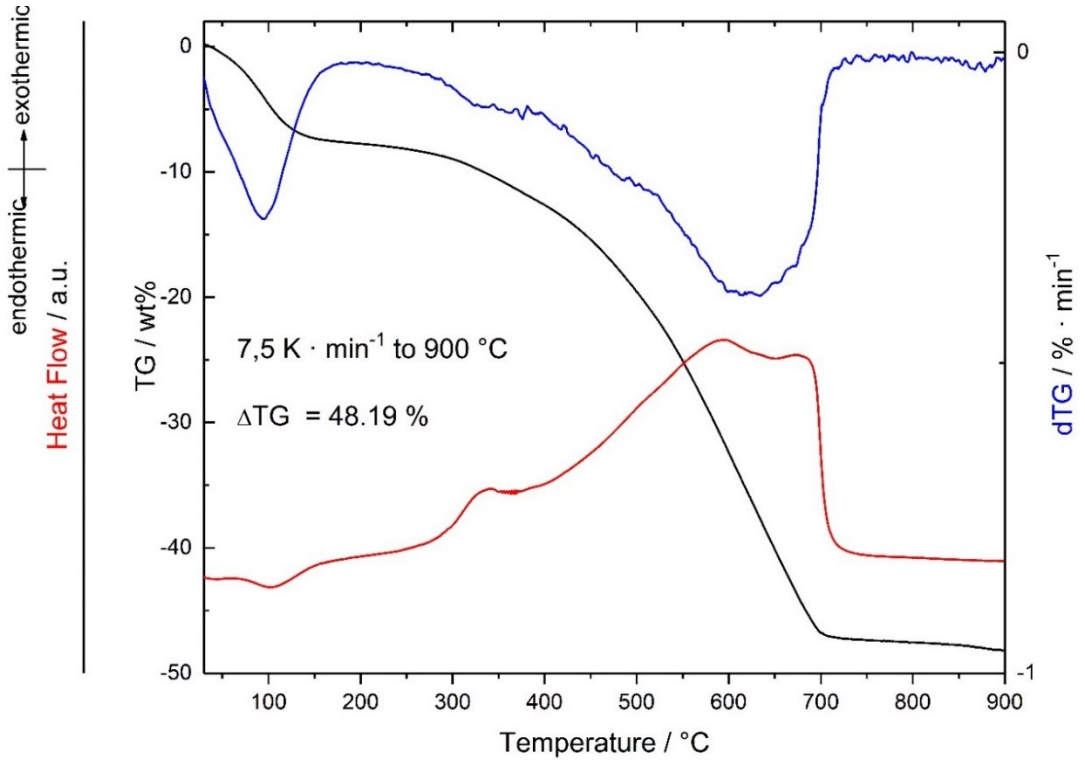


PT2-BTEB-PMO (**17**)

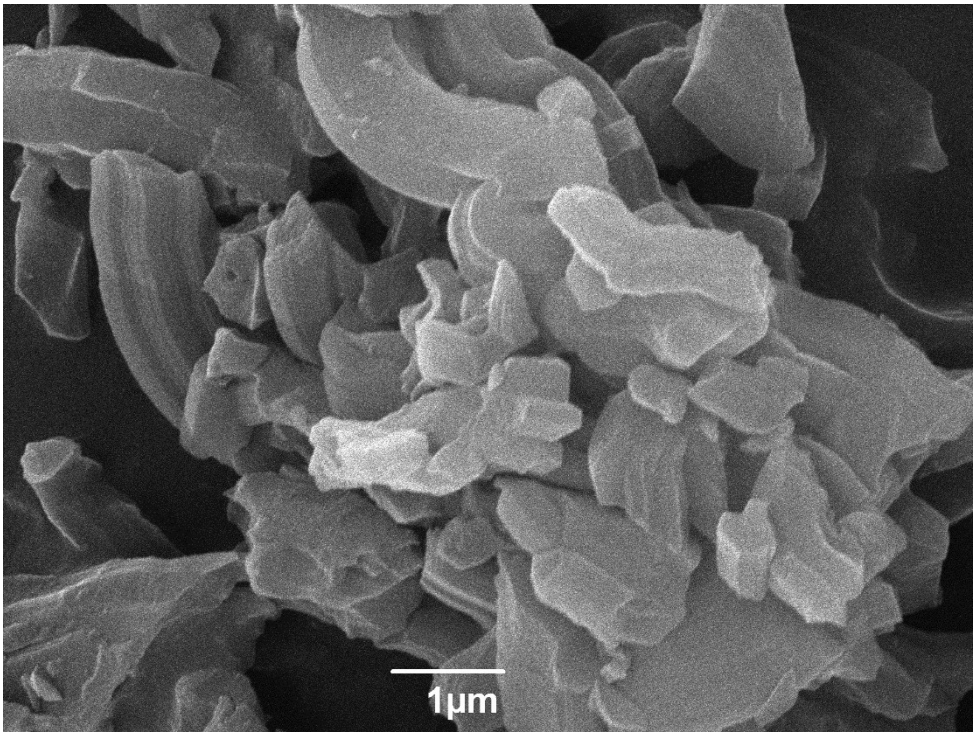
IR spectrum



TGA

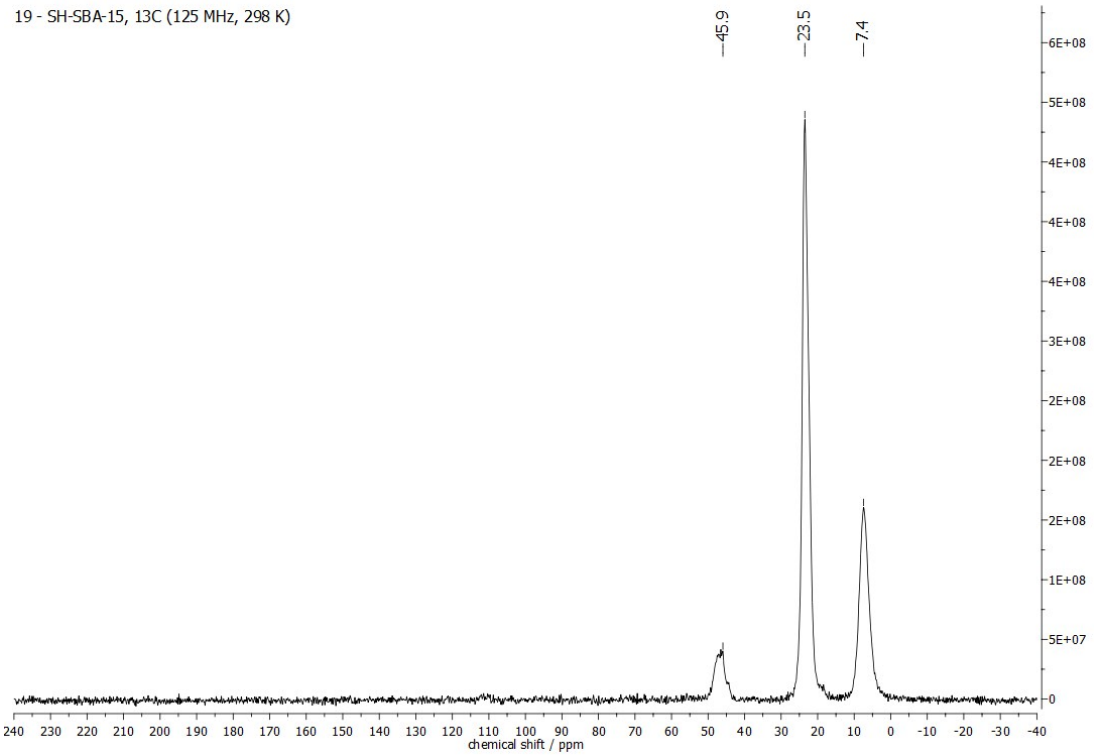


SEM

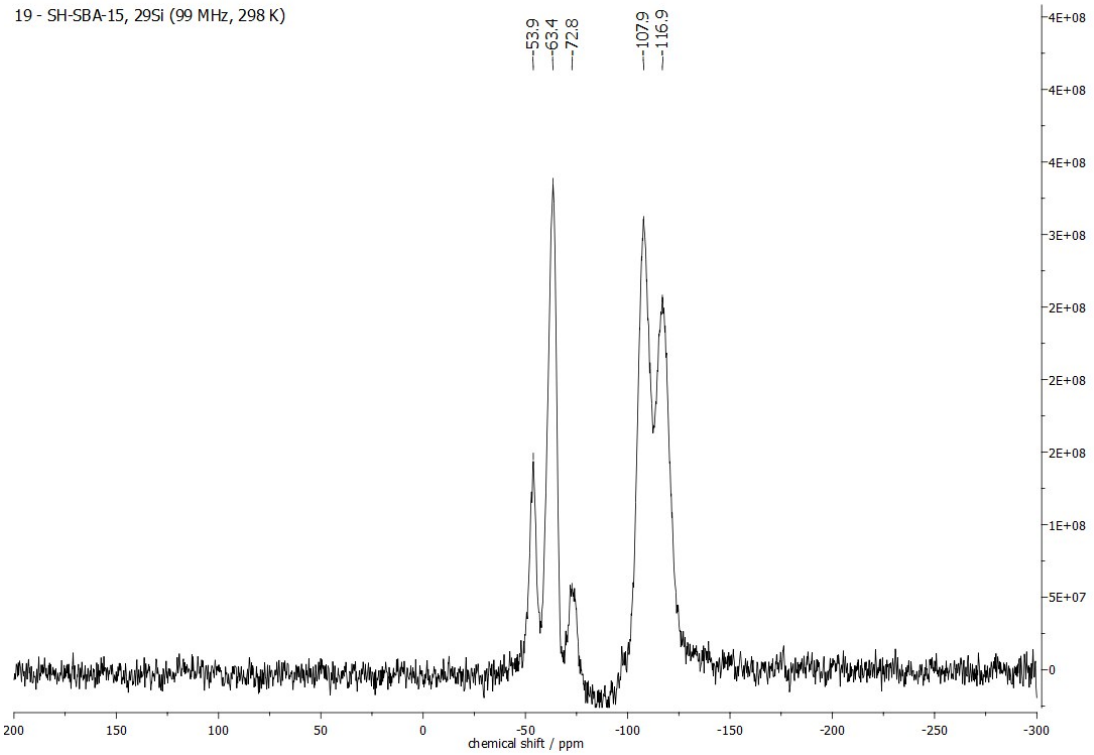


SH-SBA-15 (**19**)

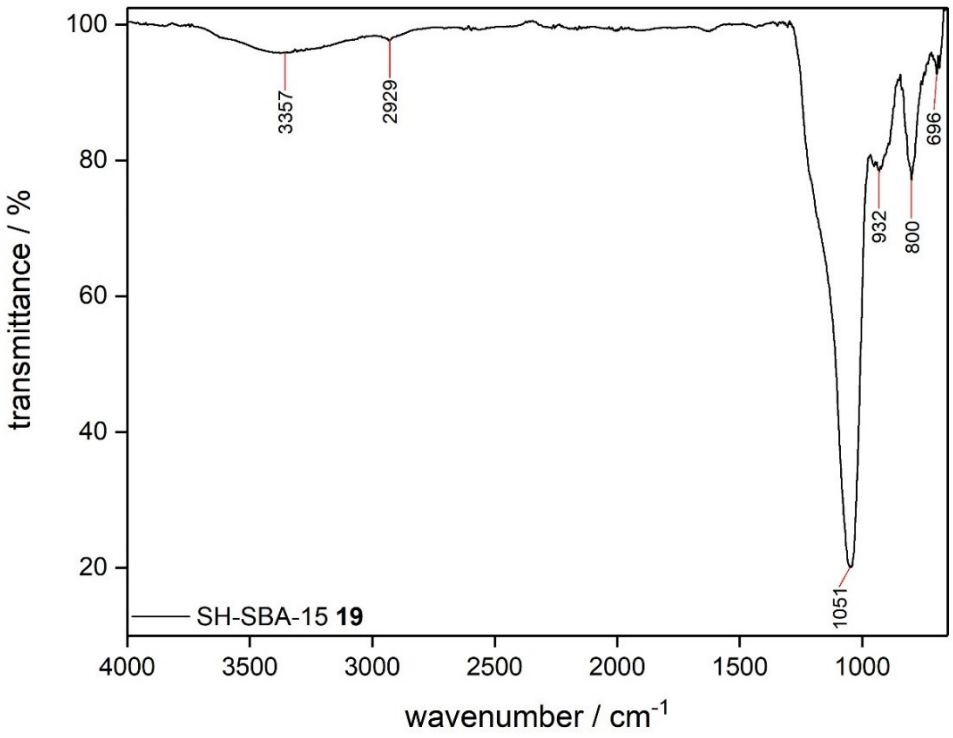
Solid state CP-MAS ^{13}C NMR spectrum



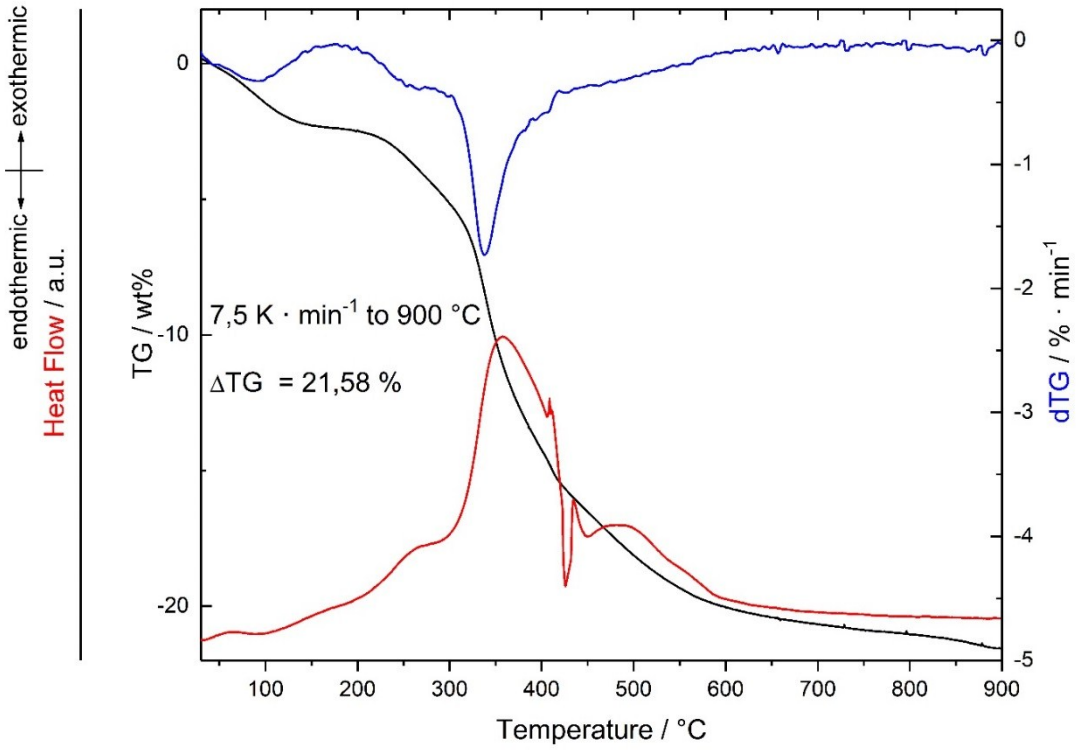
Solid state CP-MAS ^{29}Si NMR spectrum



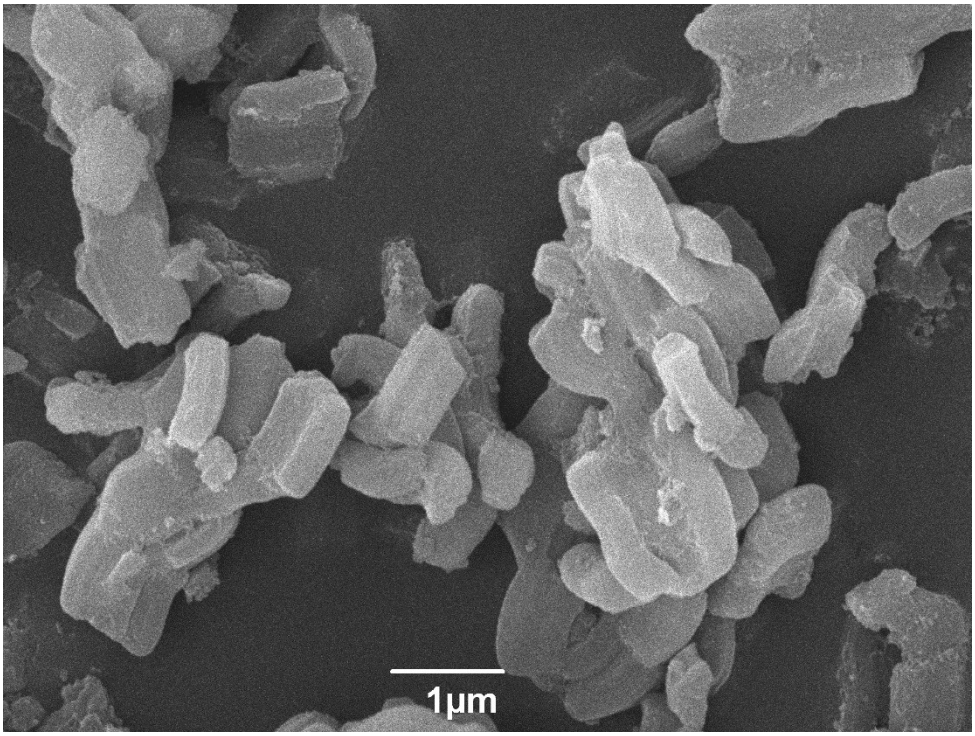
IR spectrum



TGA

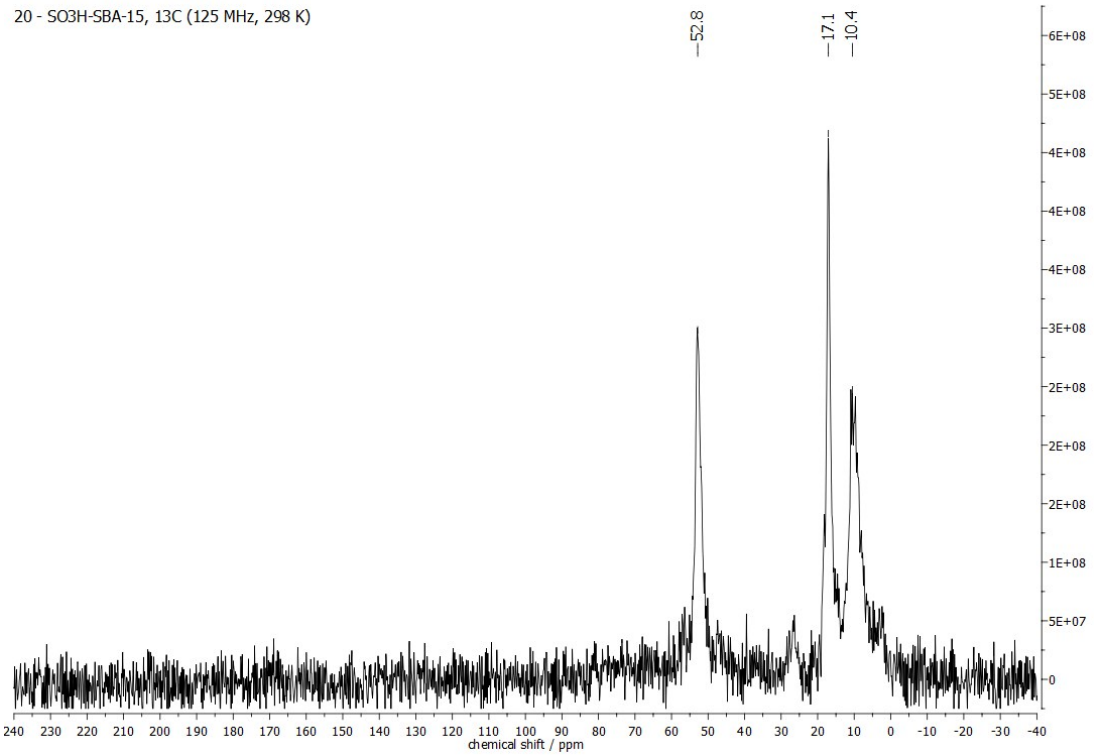


SEM

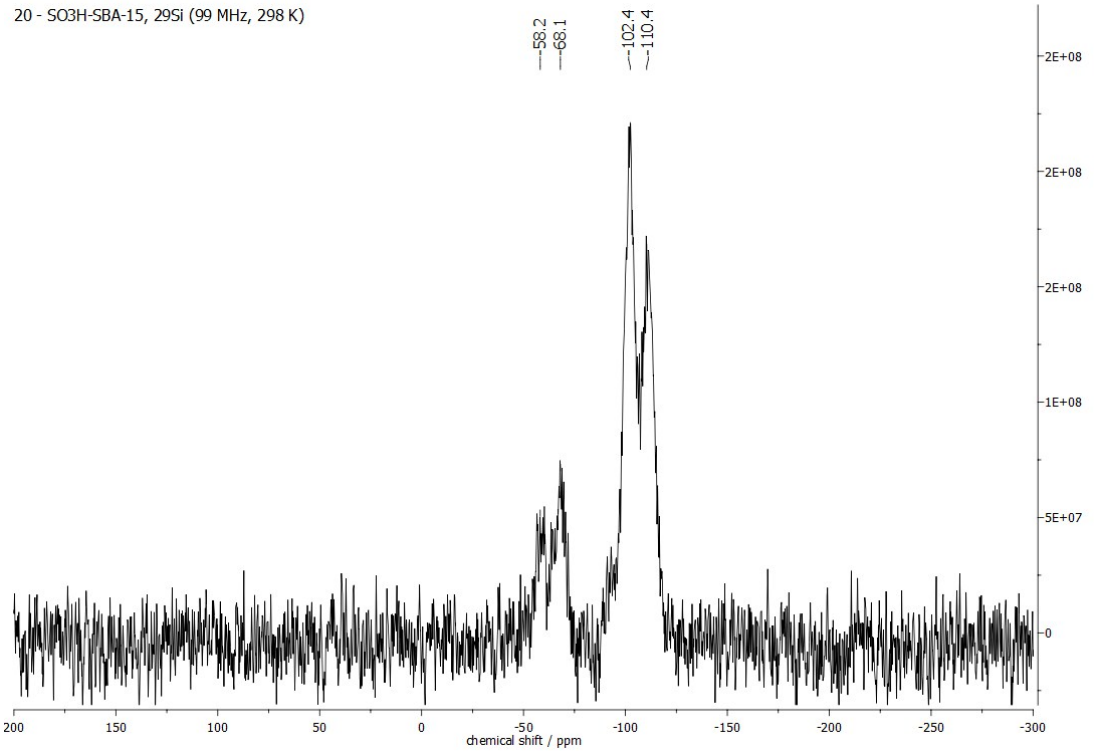


SO_3H-SBA-15 (**20**)

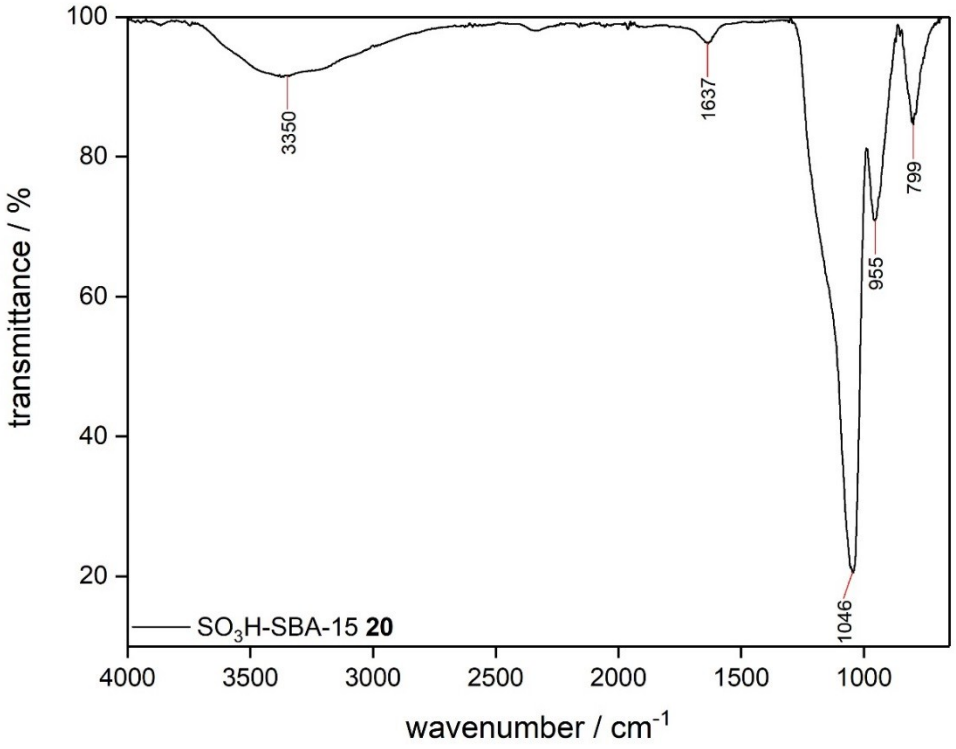
Solid state CP-MAS ^{13}C NMR spectrum



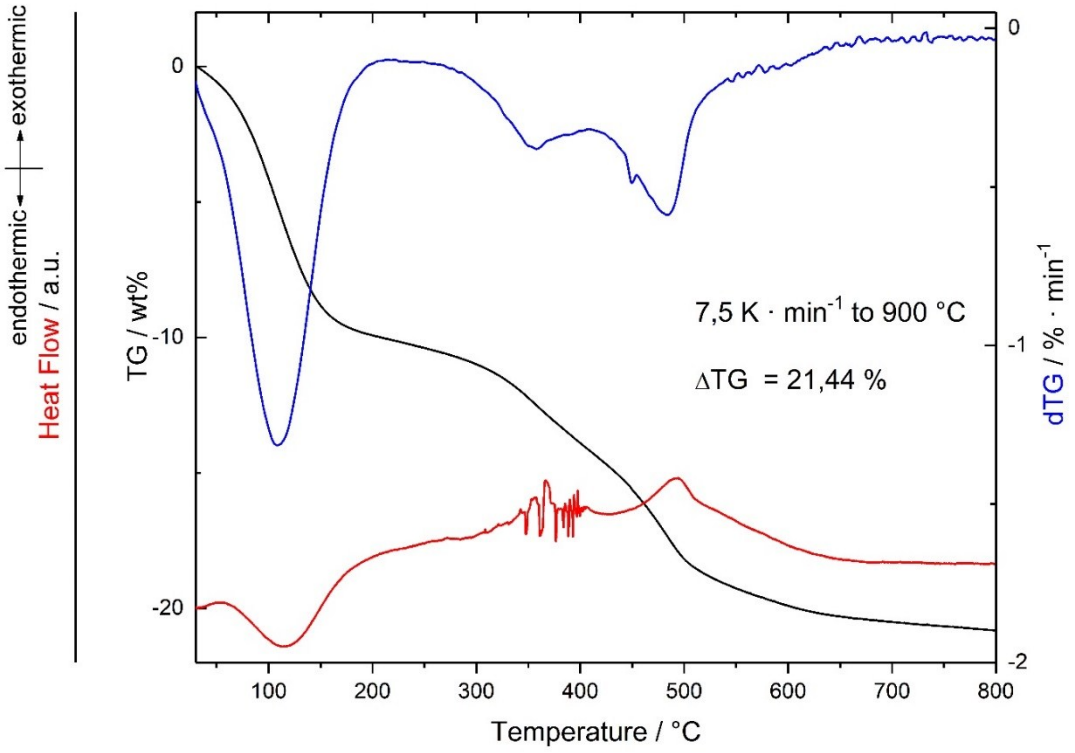
Solid state CP-MAS ^{29}Si NMR spectrum



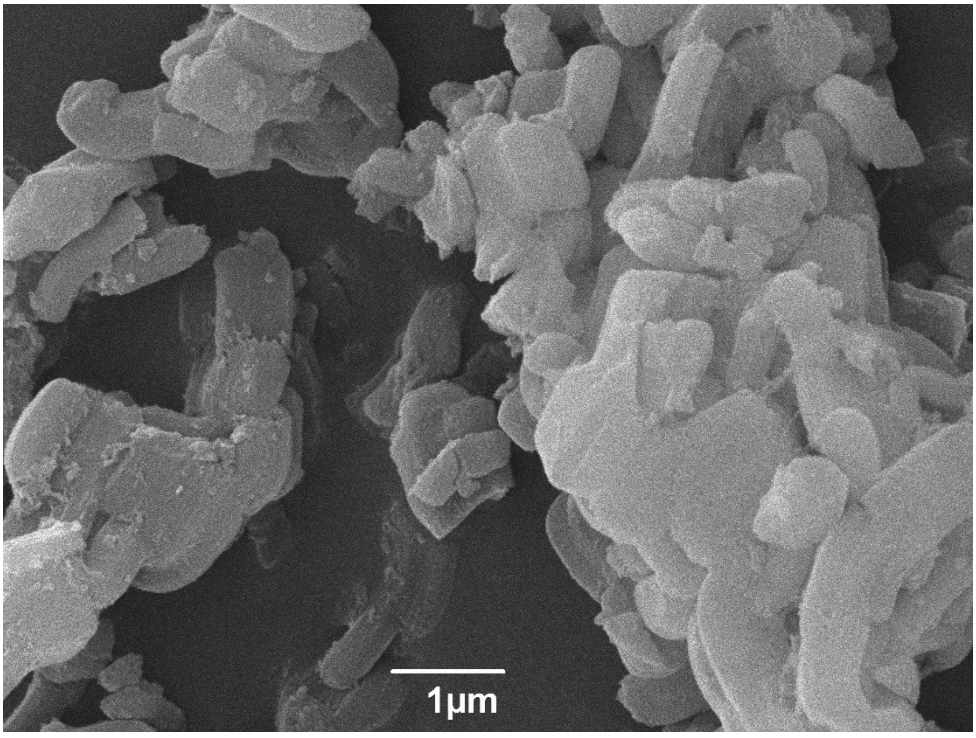
IR spectrum



TGA

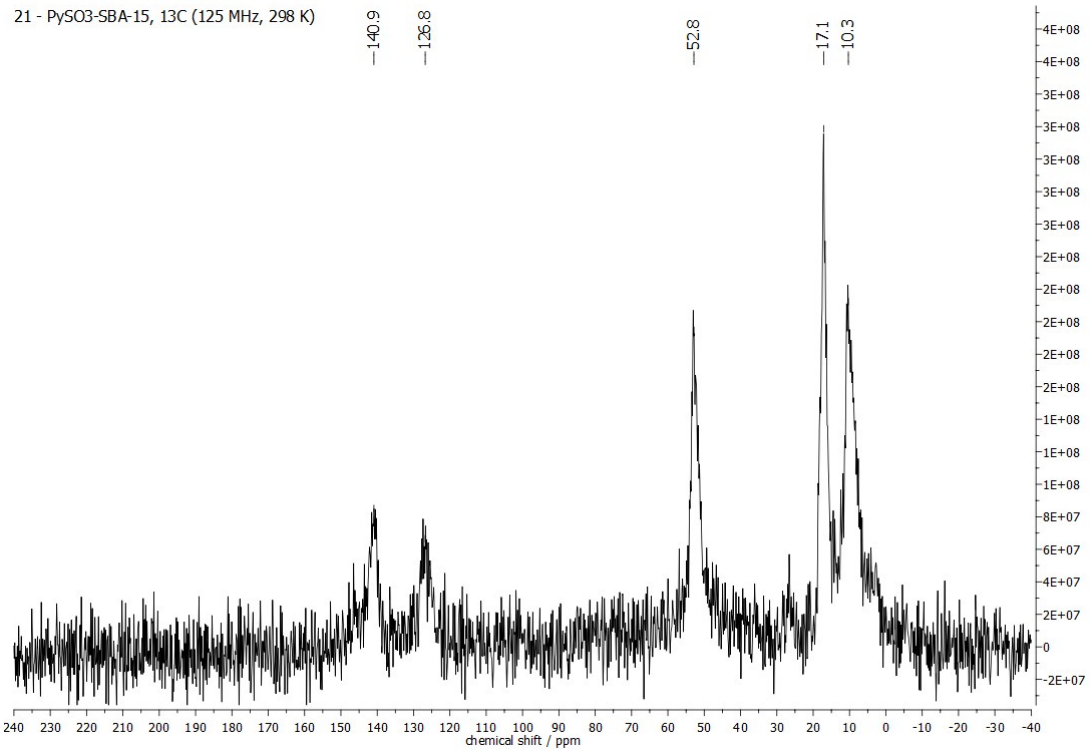


SEM

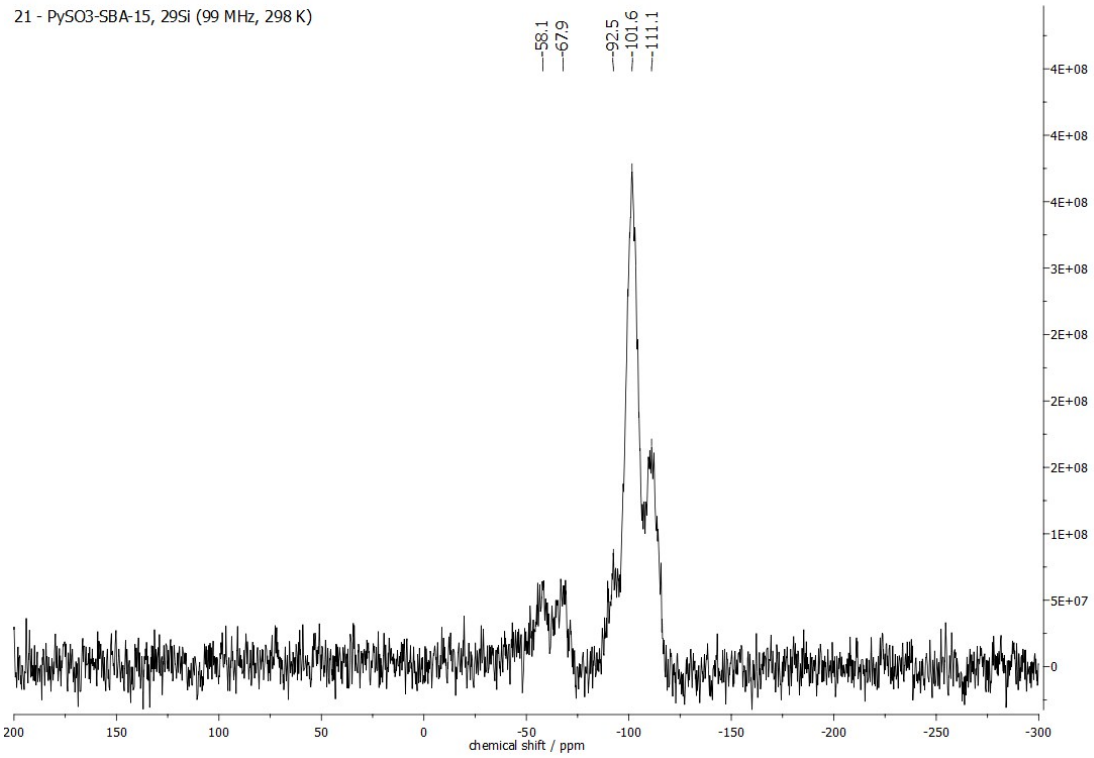


$PySO_3$-SBA-15 (**21**)

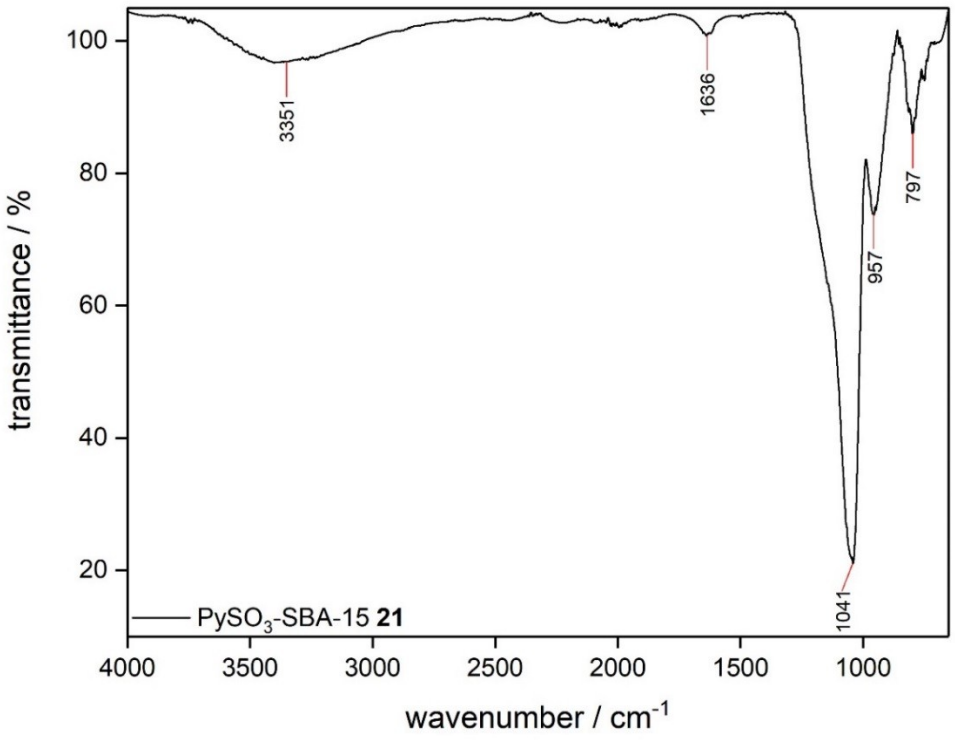
Solid state CP-MAS ^{13}C NMR spectrum



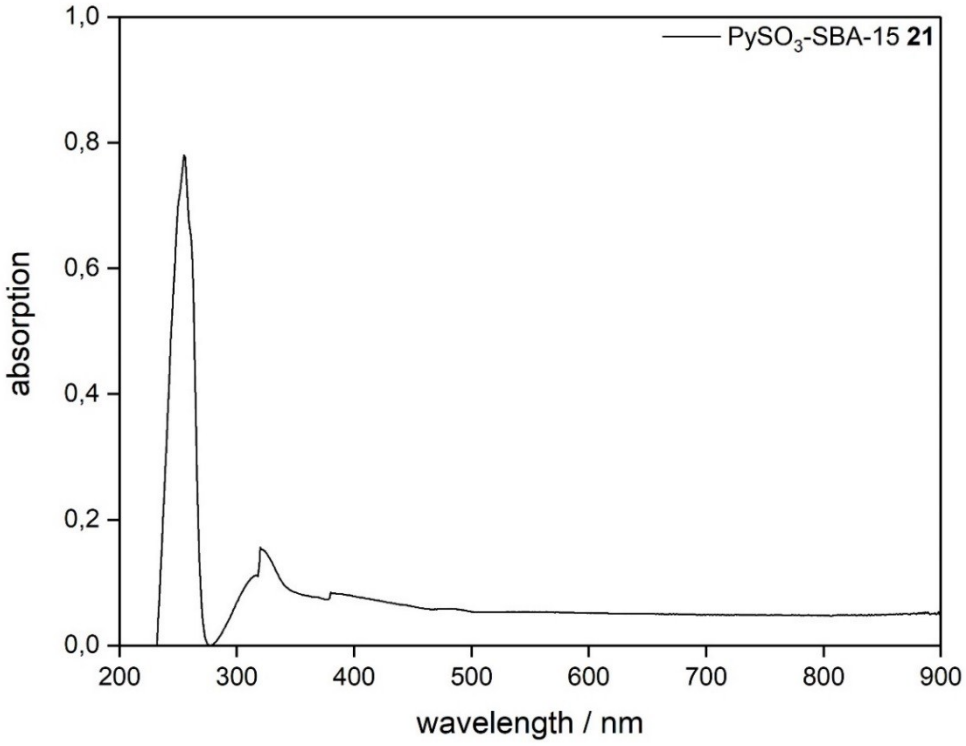
Solid state CP-MAS ^{29}Si NMR spectrum



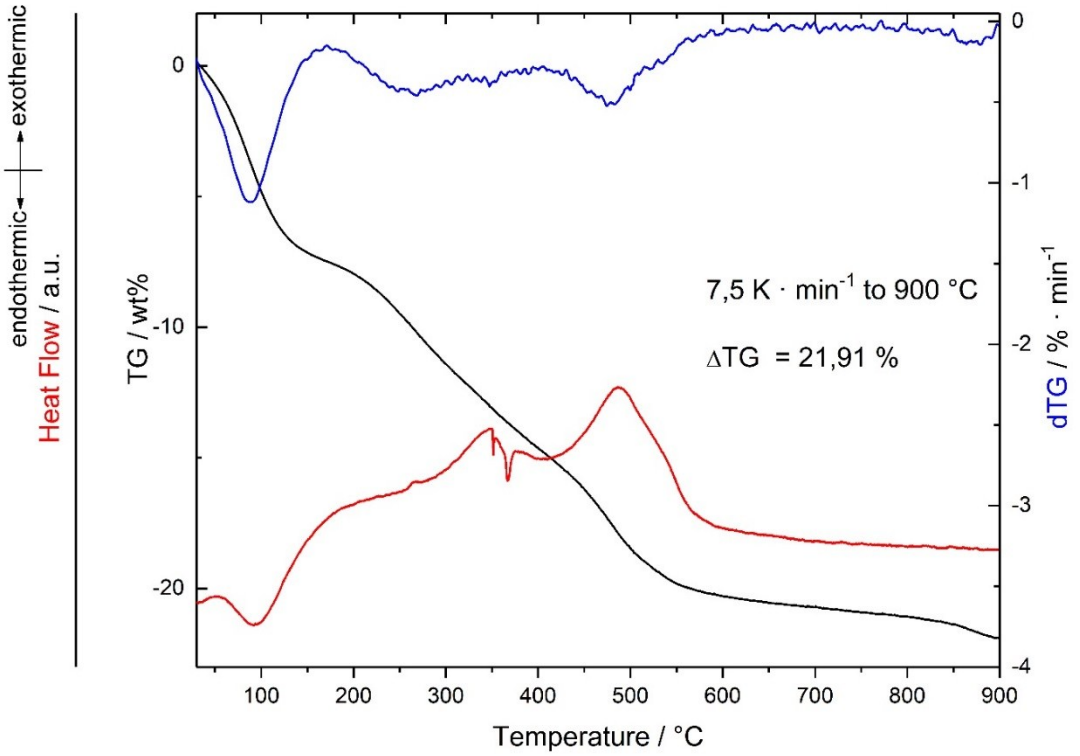
IR spectrum



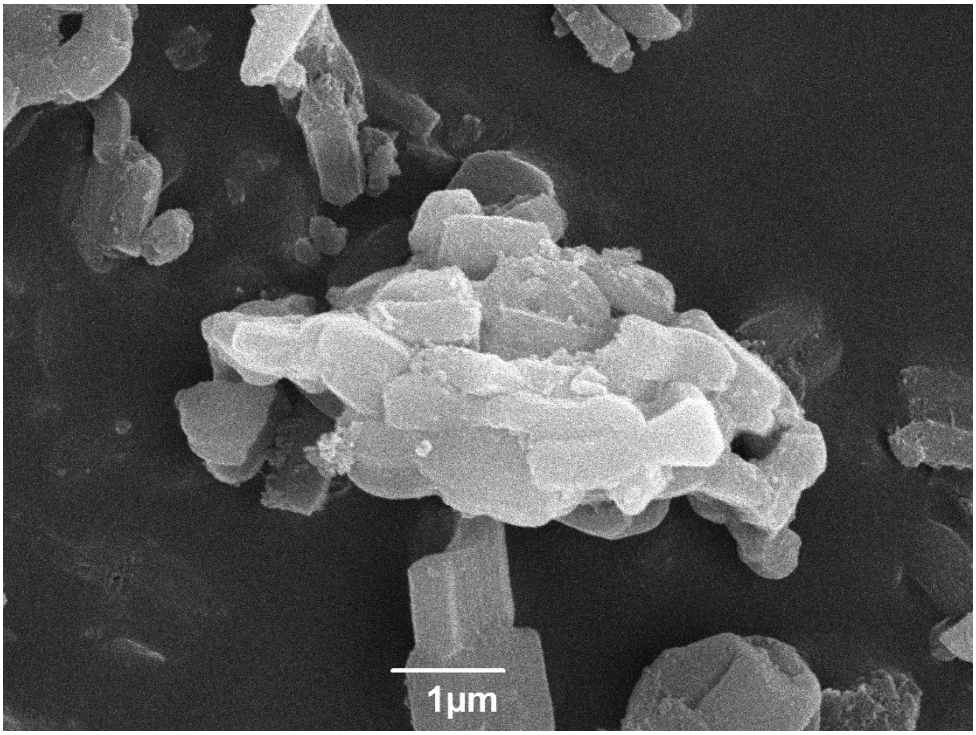
UV/Vis spectrum



TGA

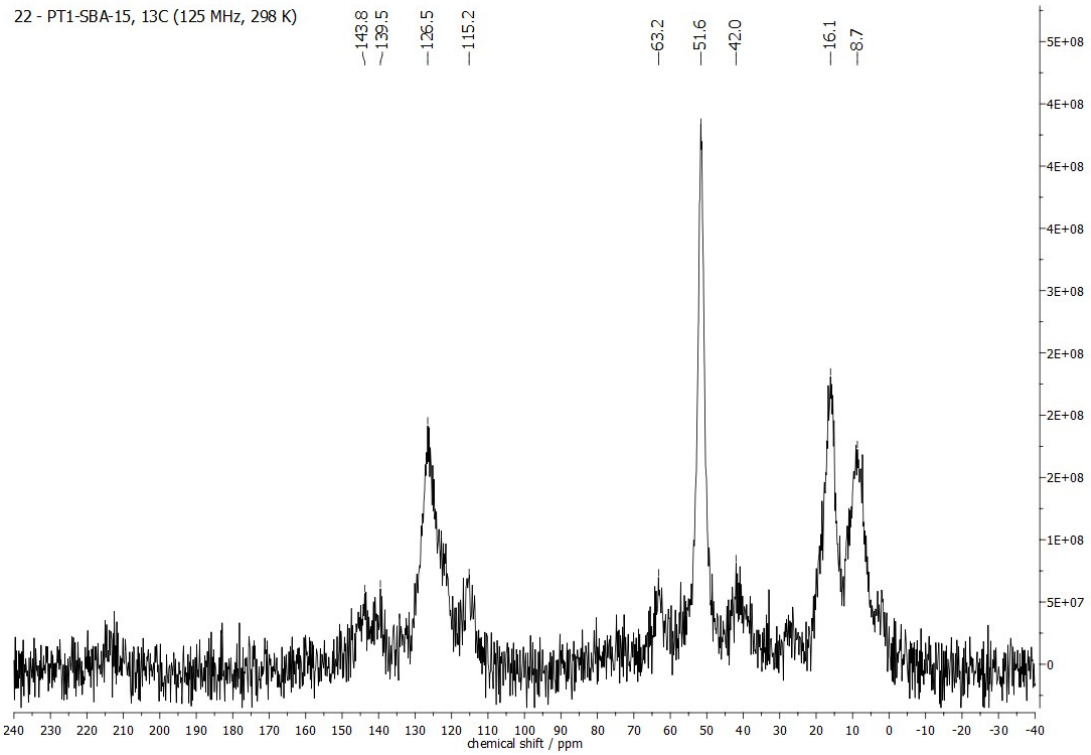

endothermic
exothermic
Heat Flow / a.u.
TG / wt%
dTG / % · min-1
7,5 K · min-1 to 900 °C
ΔTG = 21,91 %
Temperature / °C
0
-10
-20
-1
-2
-3
-4
100
200
300
400
500
600
700
800
900

SEM

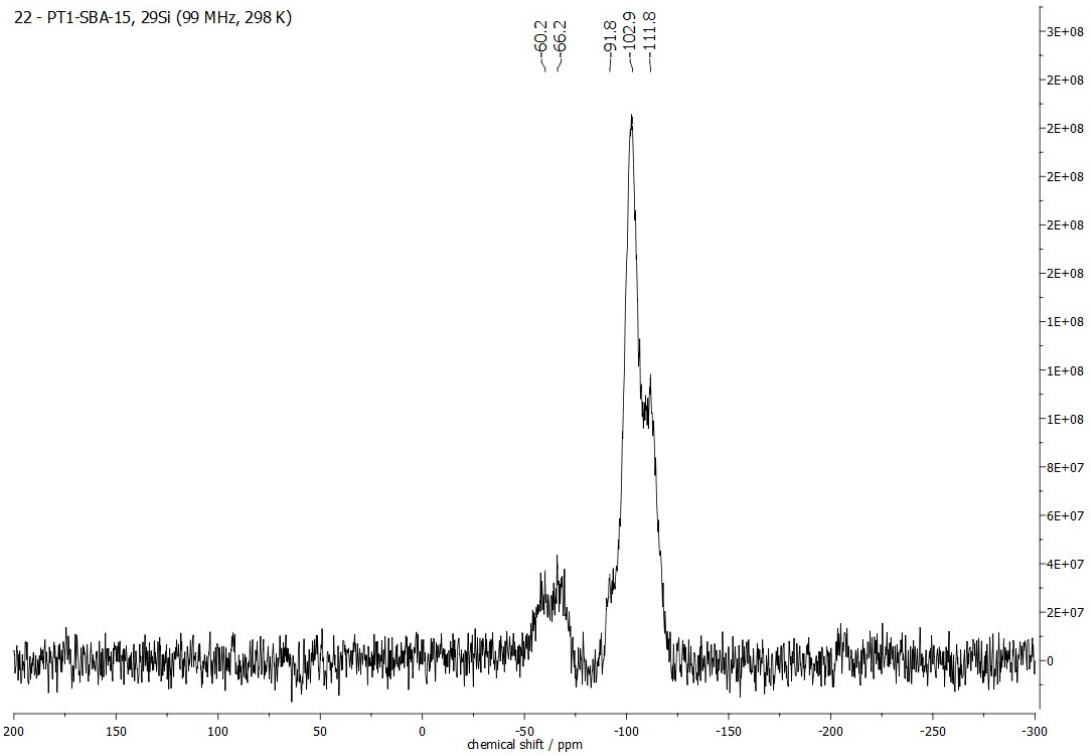

1µm

PT1-SBA-15 (**22**)

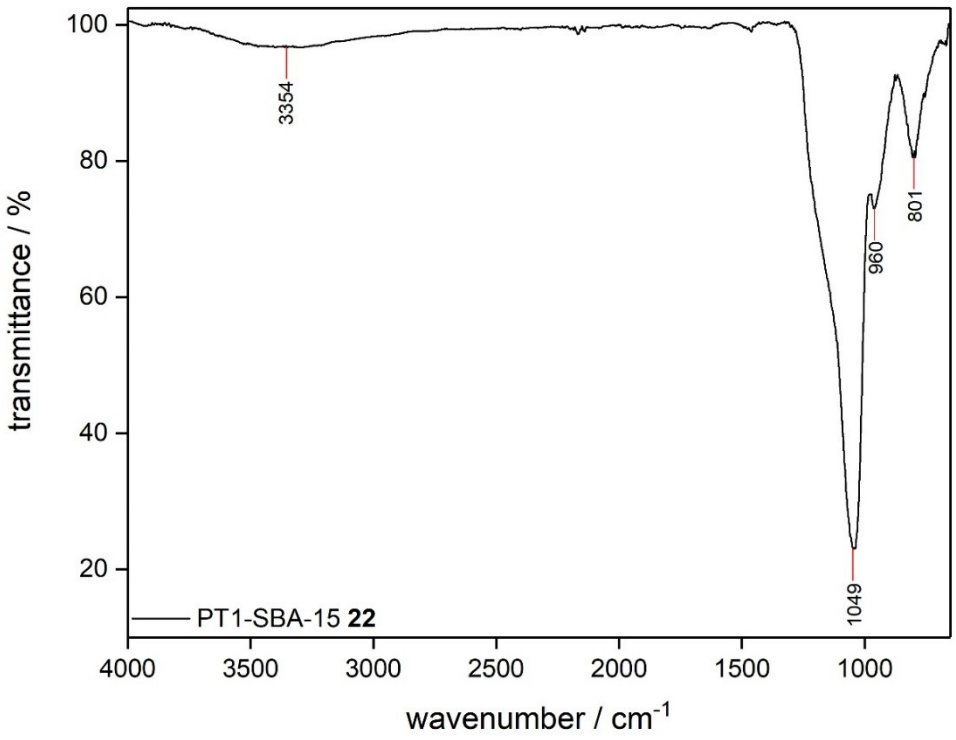
Solid state CP-MAS ^{13}C NMR spectrum



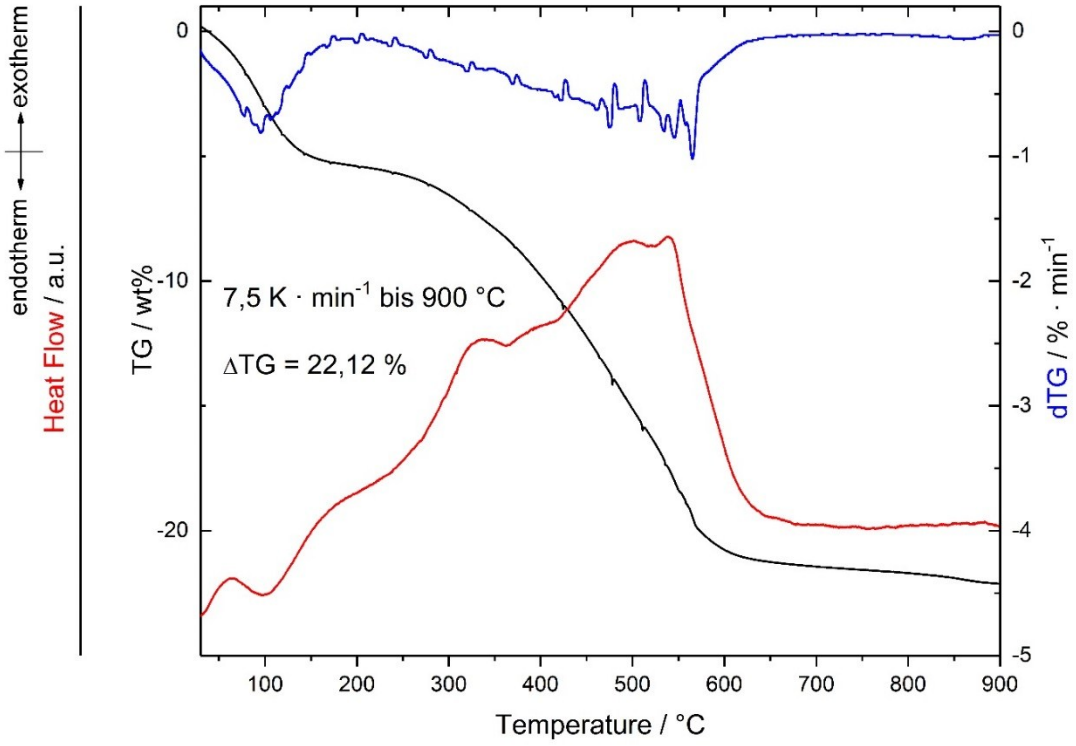
Solid state CP-MAS ^{29}Si NMR spectrum



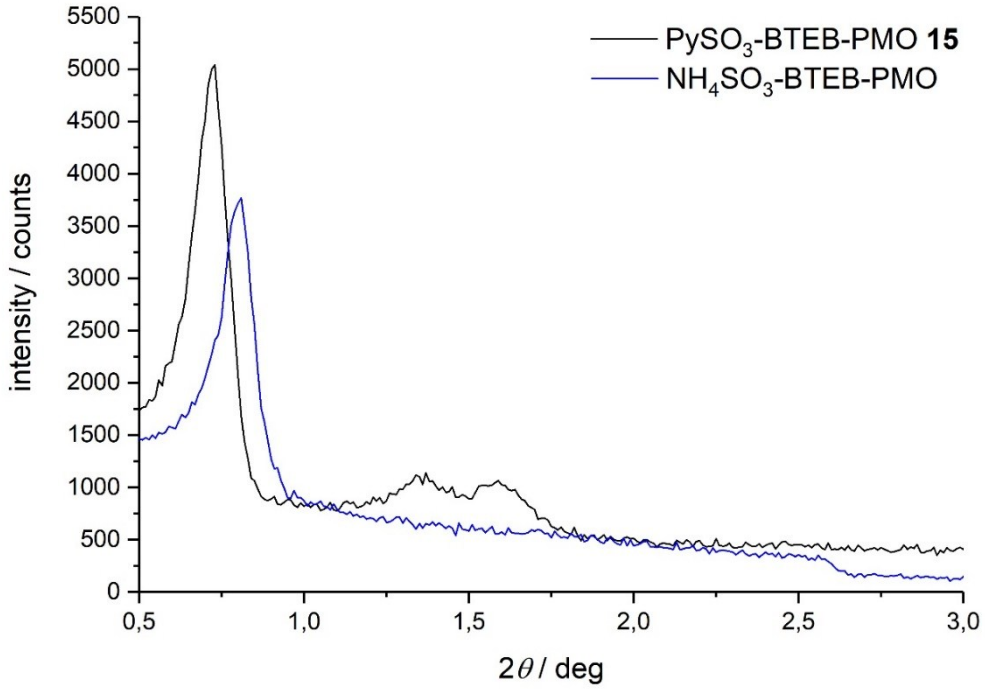
IR spectrum



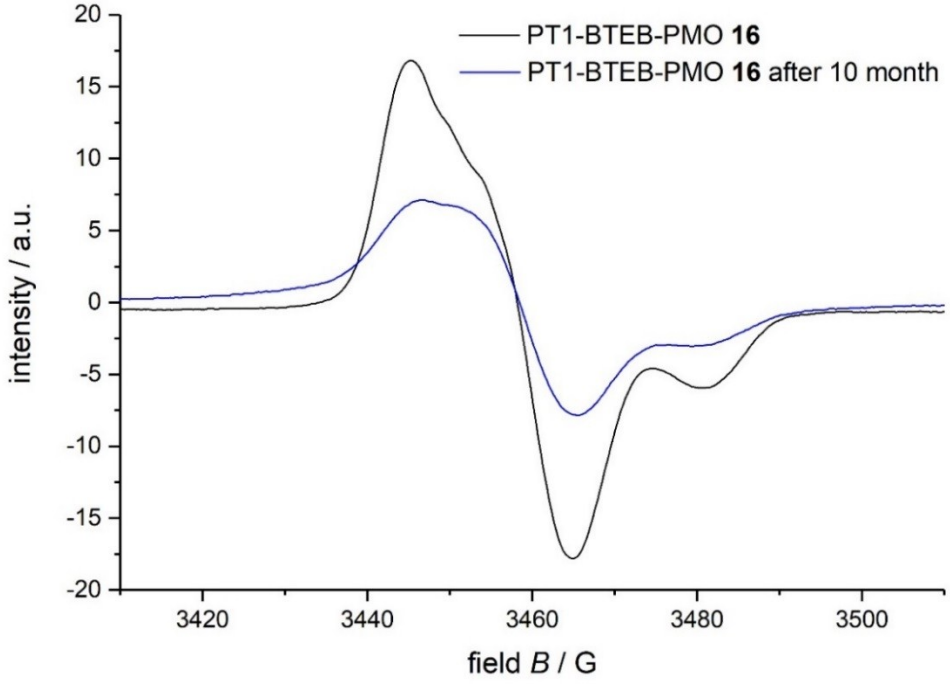
TGA



Comparison of generating sulfonate loaded PMOs over NH_3 and pyridine in the powder XRD



PT1-BTEB-PMO (**16**) after generating the radical cation and after 10 month of storage in the dark



PT2-BTEB-PMO (**17**) after generating the radicalcation and after 10 month of storage in the dark