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An attempt to prepare sulfonyl analogues of Fotemustine: unexpected rearrangement to sulfamate during nitrosation step

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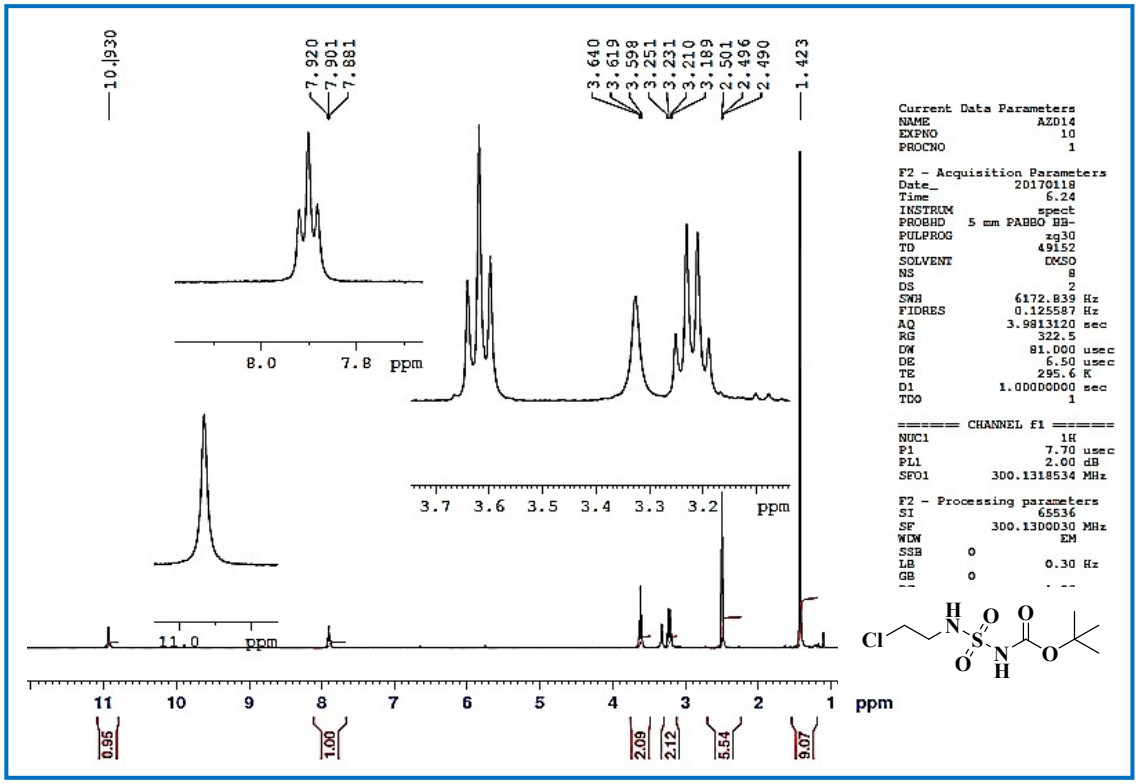
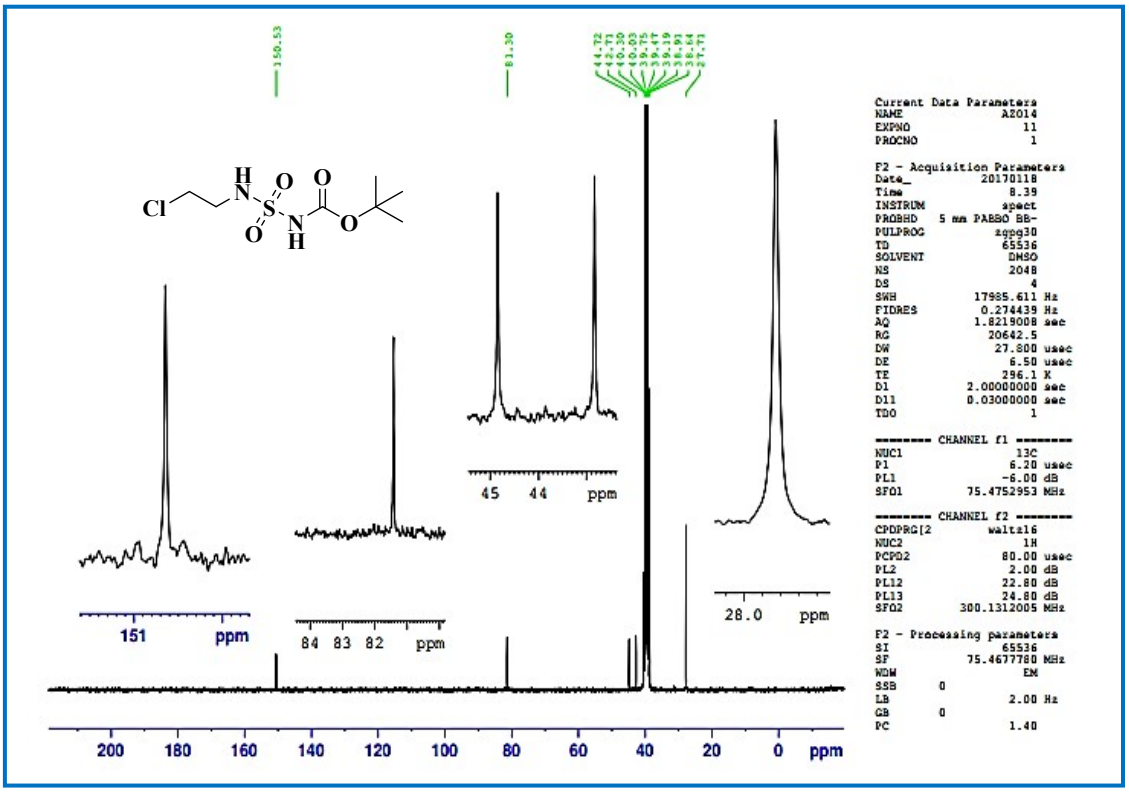
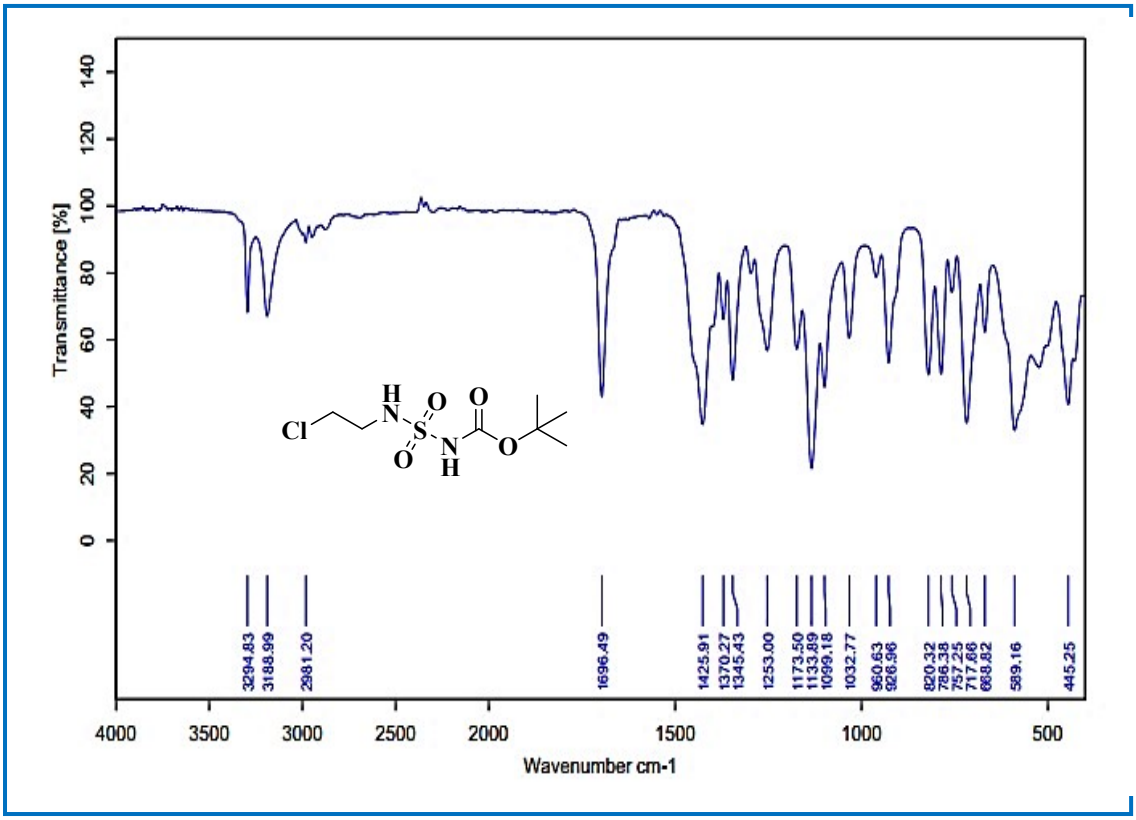
Supporting Information



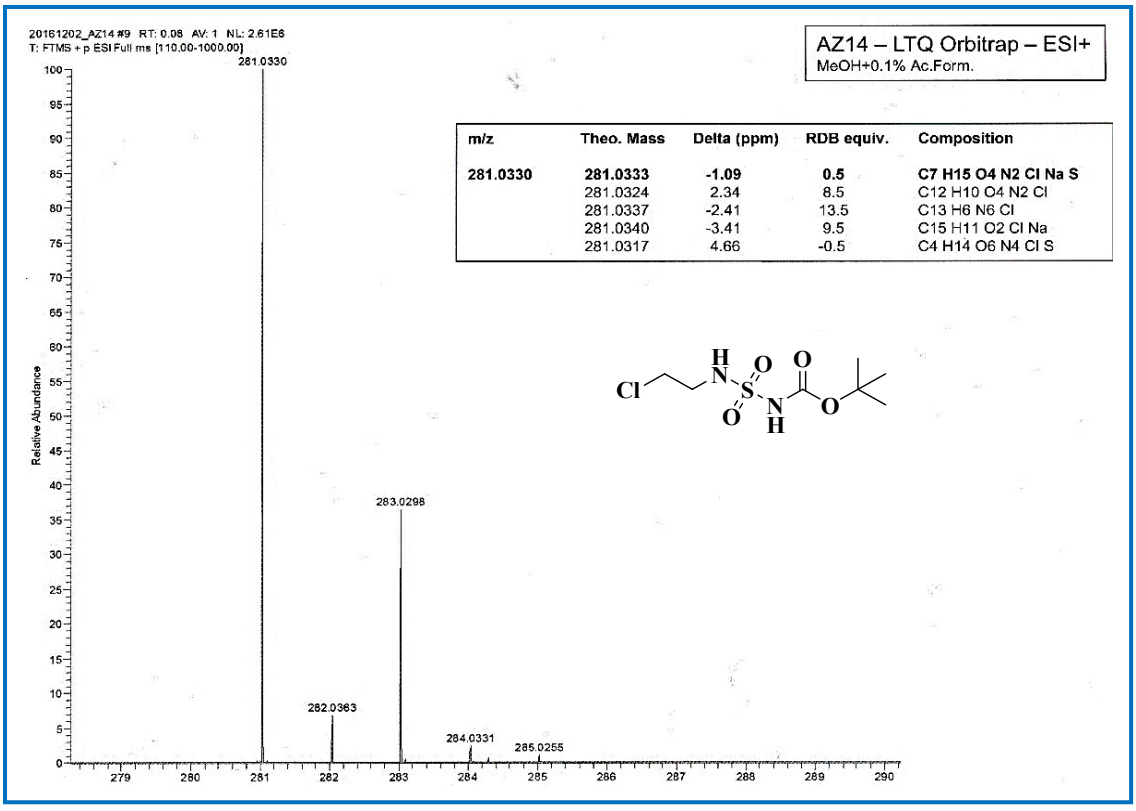
[1]H NMR Spectrum: *Tert-butyl (N-(2-chloroethyl)sulfamoyl)carbamate* **(14)**



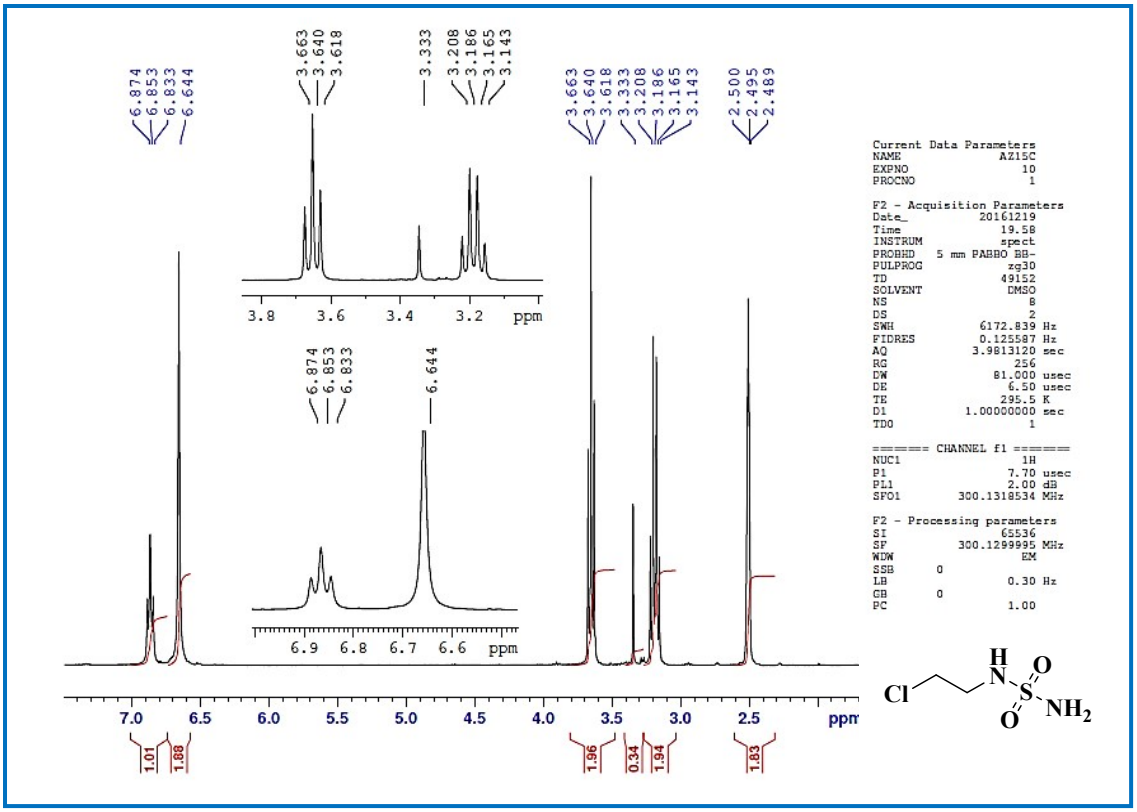
[13]C NMR Spectrum: *Tert-butyl (N-(2-chloroethyl)sulfamoyl)carbamate* **(14)**



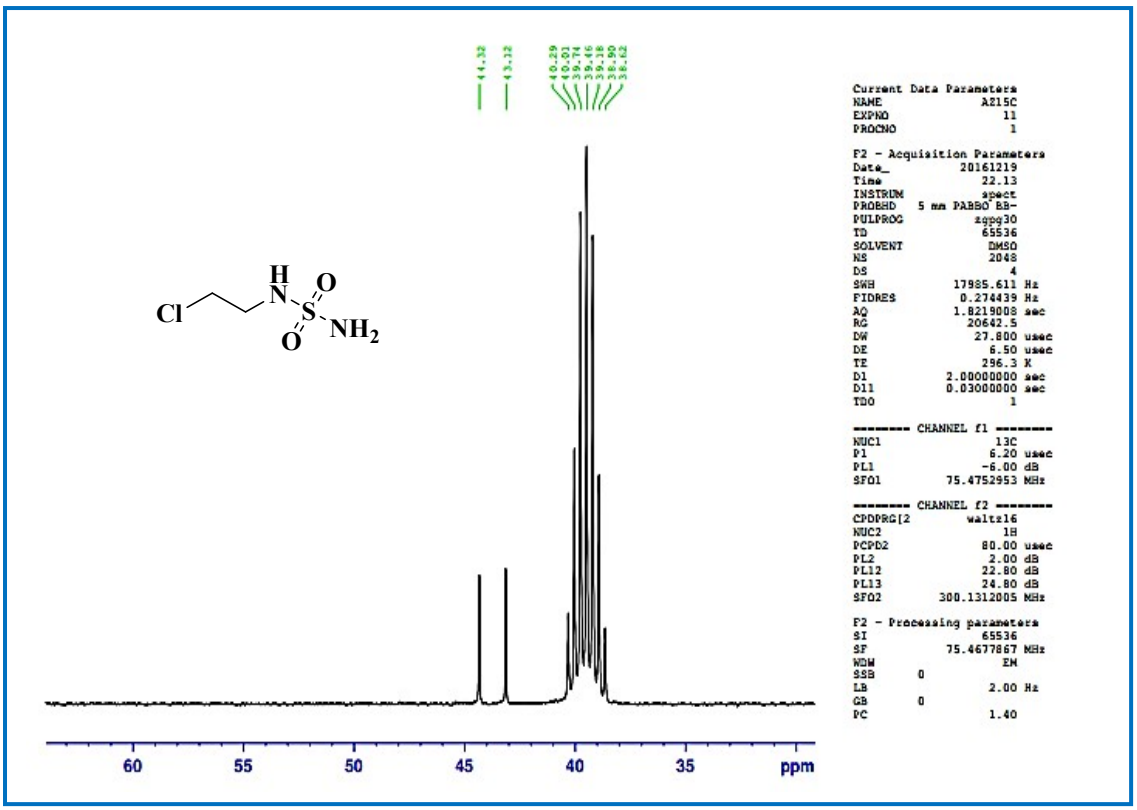
IR Spectrum: *Tert-butyl (N-(2-chloroethyl)sulfamoyl)carbamate* **(14)**



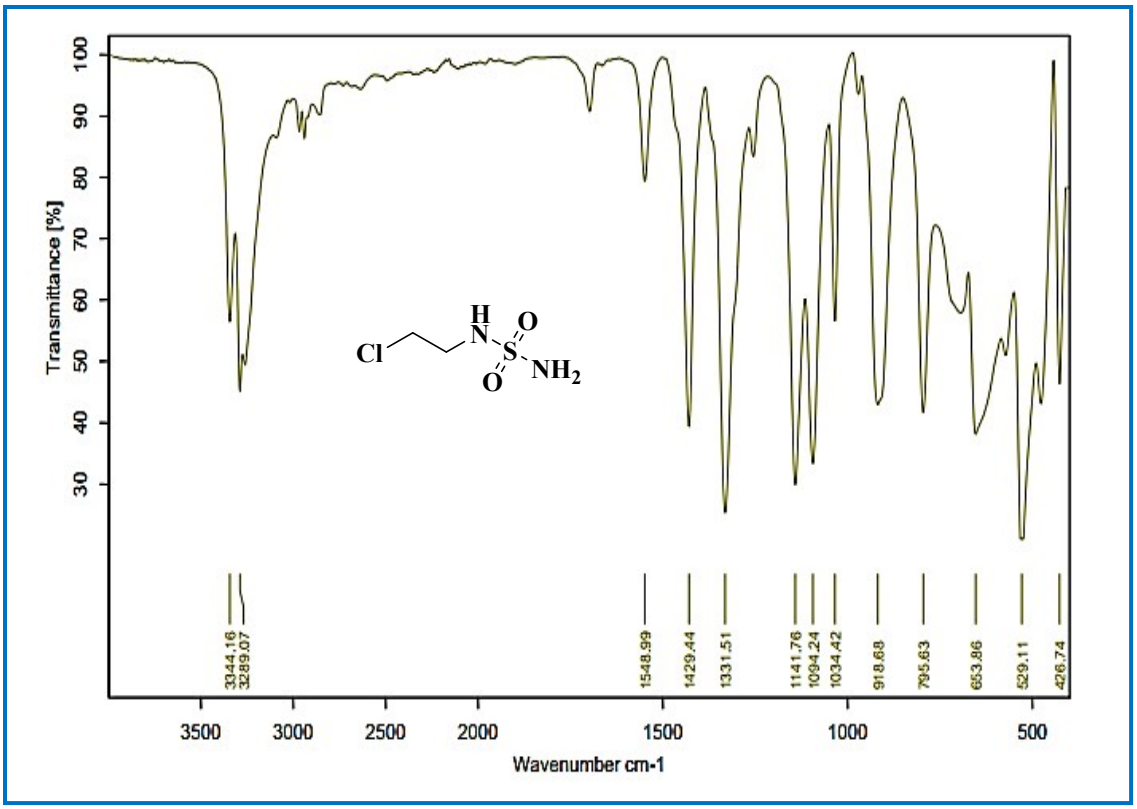
MS Spectrum: *Tert-butyl (N-(2-chloroethyl)sulfamoyl)carbamate* **(14)**



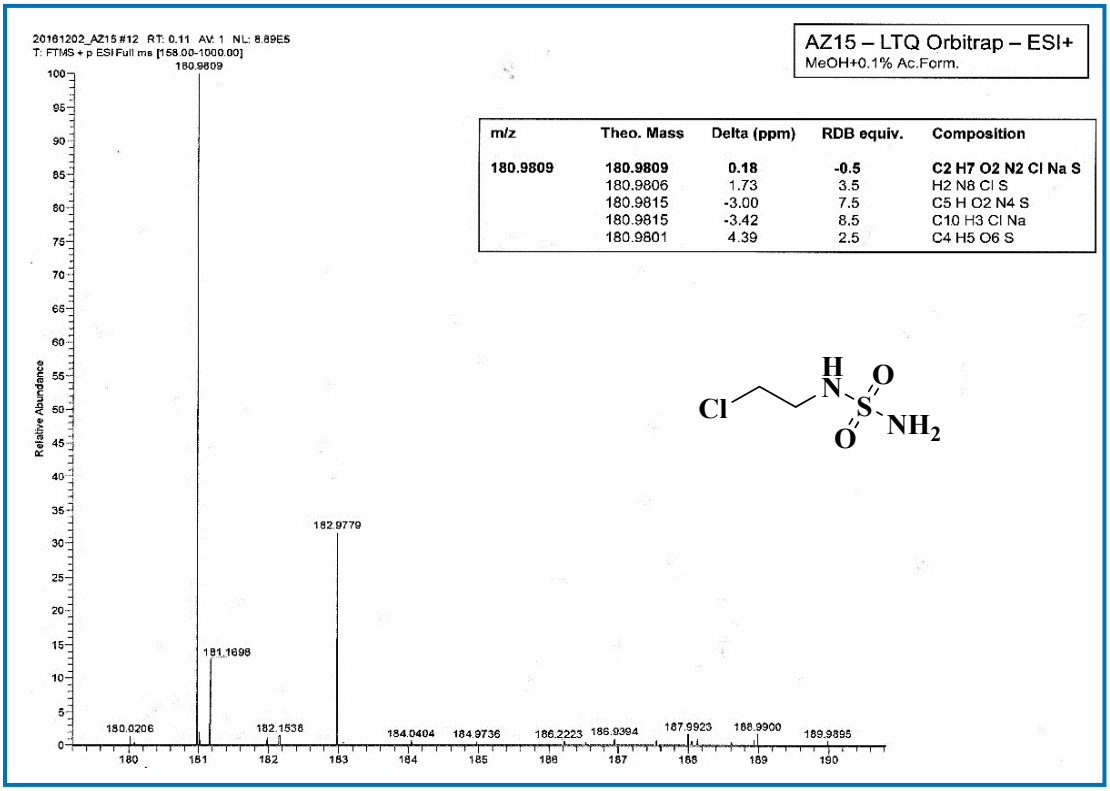
[1]H NMR Spectrum: *2-Chloroethylsulfamide* **(15)**



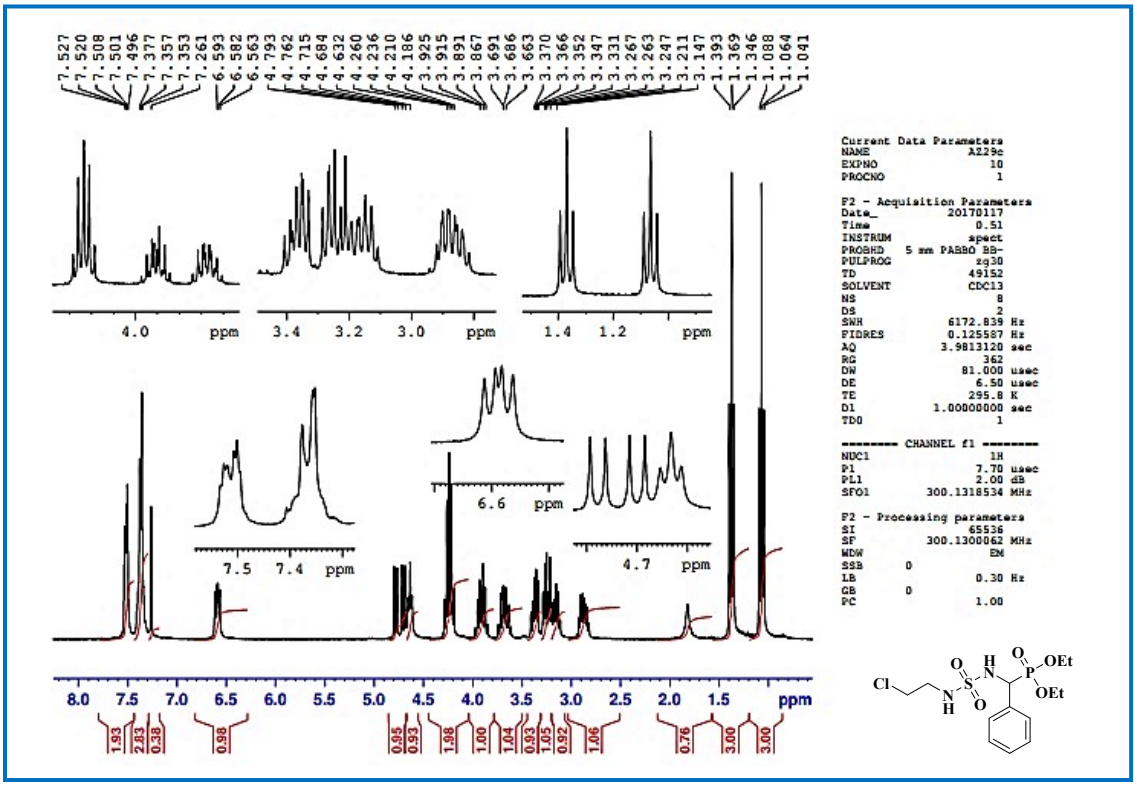
[13]C NMR Spectrum: *2-Chloroethylsulfamide* **(15)**



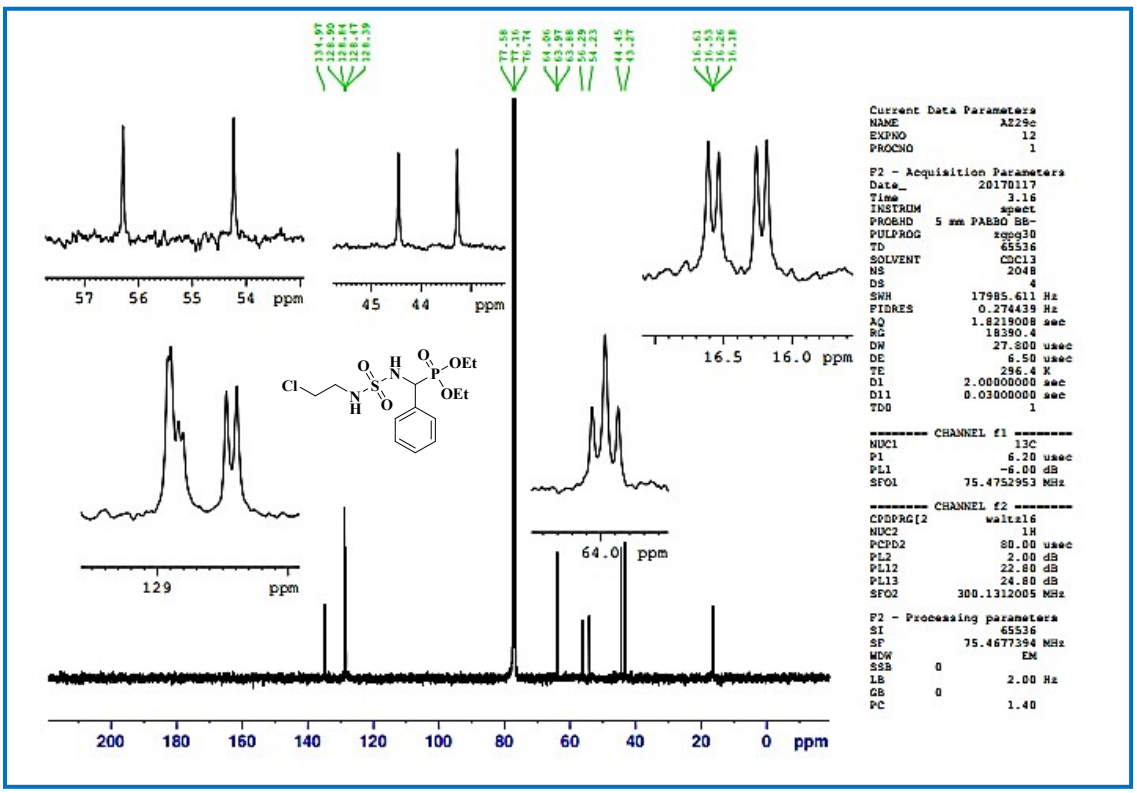
IR Spectrum: *2-Chloroethylsulfamide* **(15)**



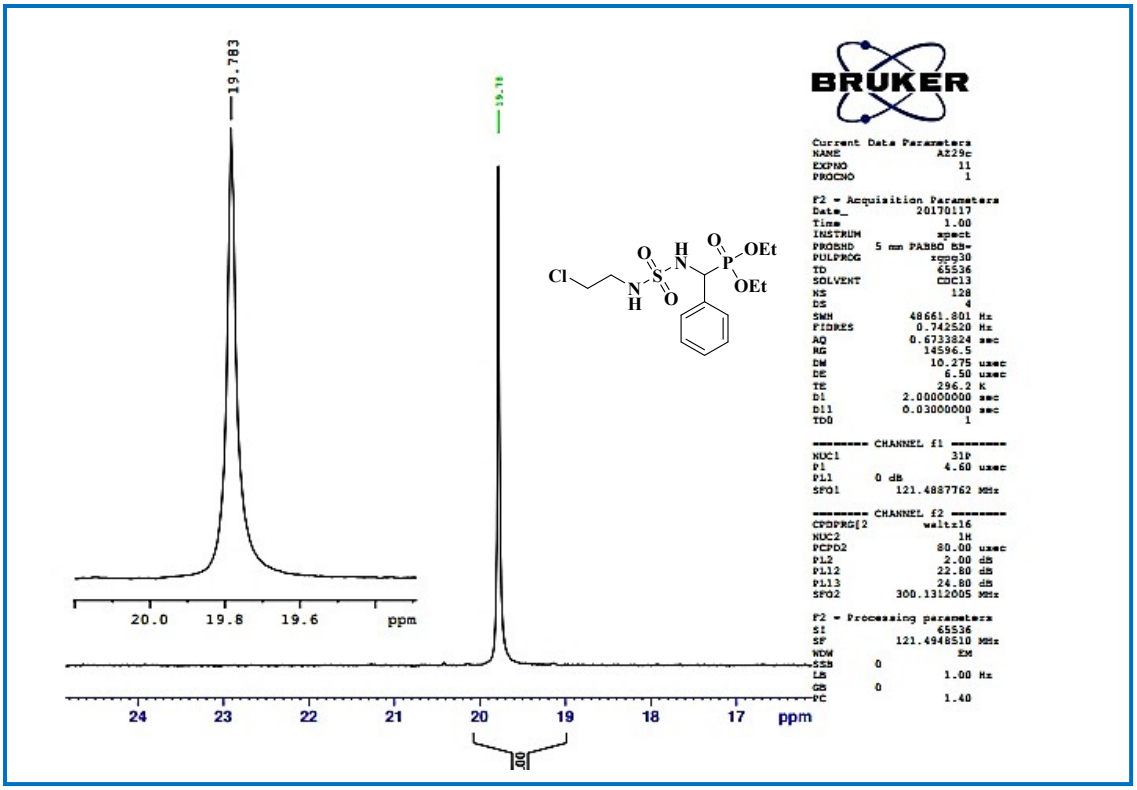
MS Spectrum: *2-Chloroethylsulfamide* **(15)**



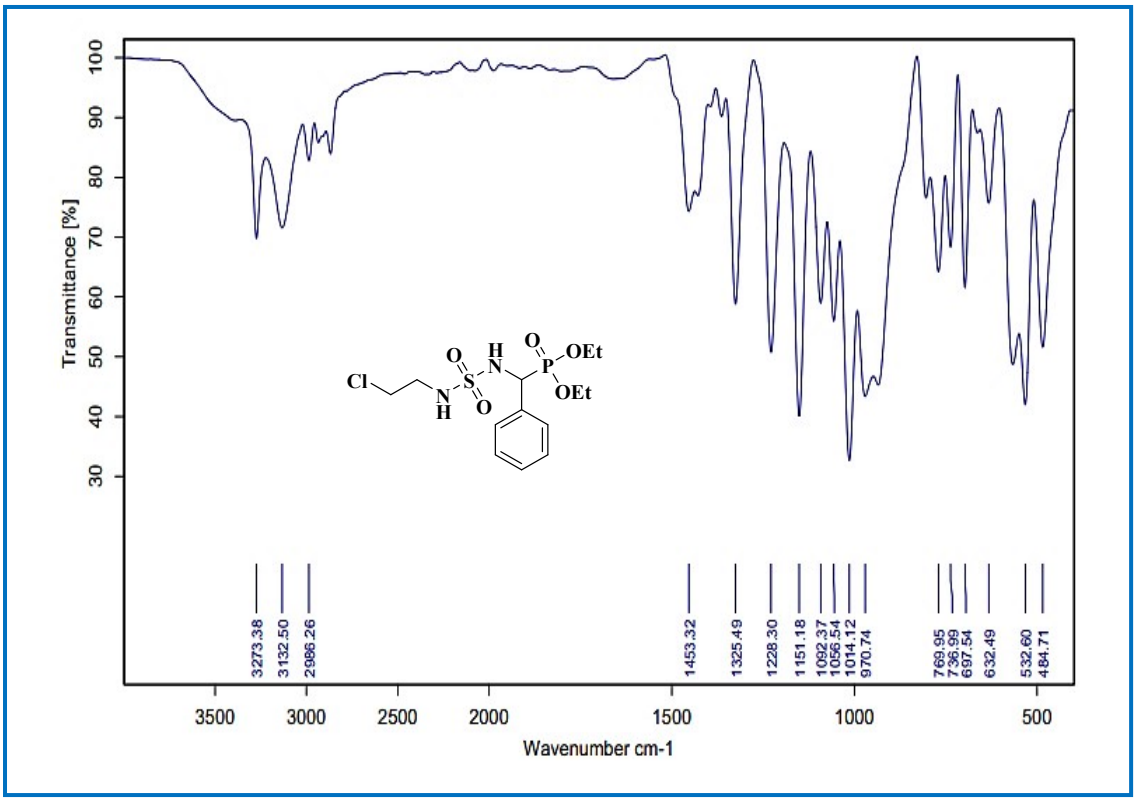
^{1}***H NMR Spectrum:*** *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16a)**



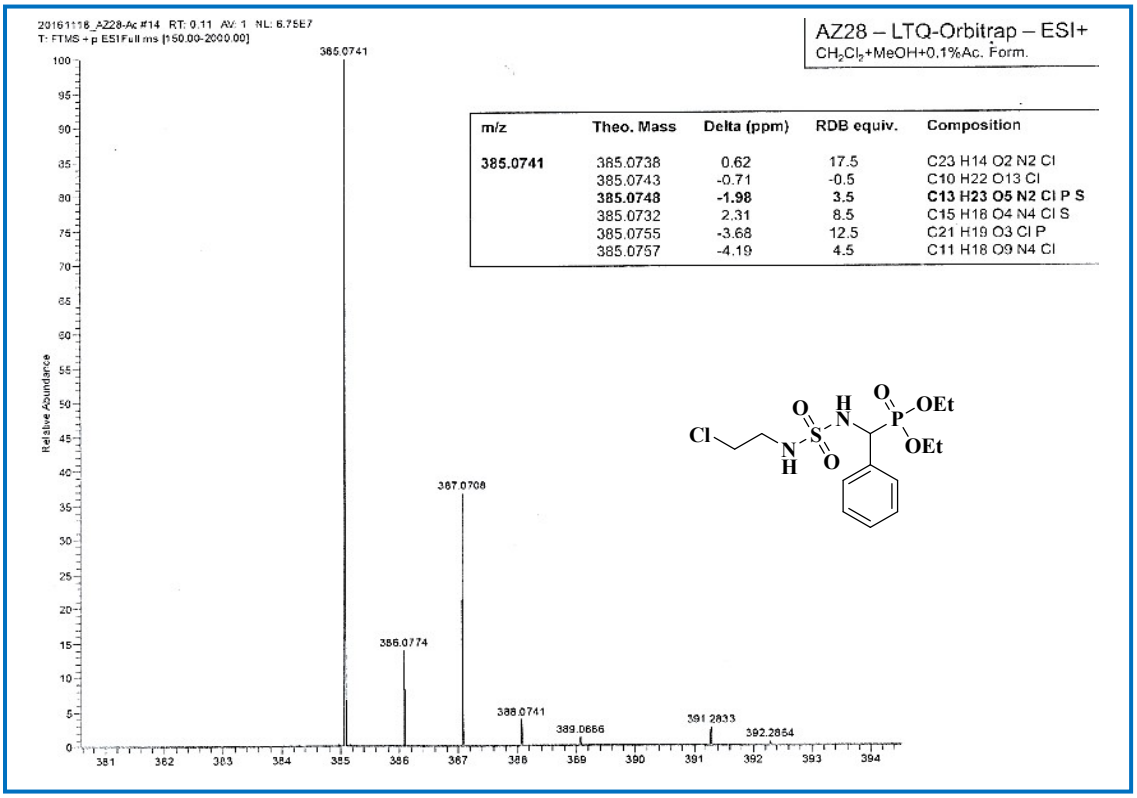
^{13}***C NMR Spectrum:*** *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16a)**



*[31]**P NMR Spectrum:*** *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16a)**

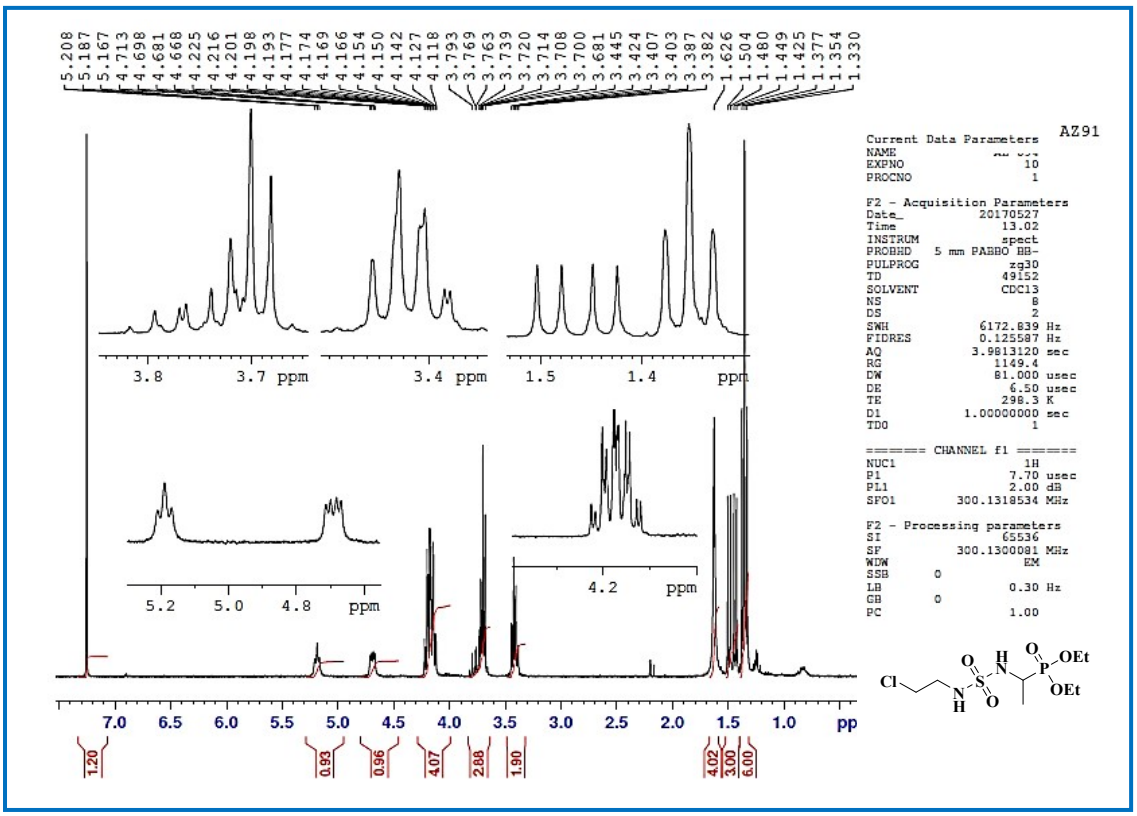


IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16a)**

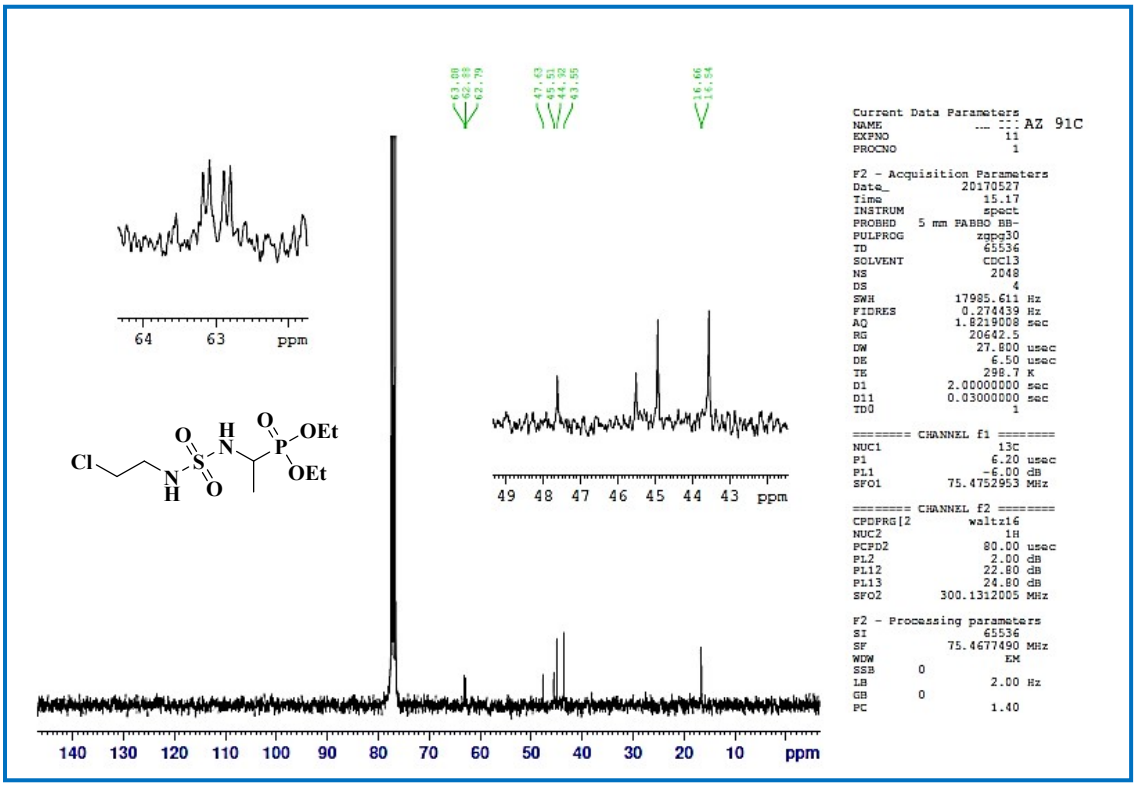


m/z	Theo. Mass	Delta (ppm)	RDB equiv.	Composition
385.0741	385.0738	0.62	17.5	C23 H14 O2 N2 Cl
	385.0743	-0.71	-0.5	C10 H22 O13 Cl
	385.0748	**-1.98**	**3.5**	**C13 H23 O5 N2 Cl P S**
	385.0732	2.31	8.5	C15 H18 O4 N4 Cl S
	385.0755	-3.68	12.5	C21 H19 O3 Cl P
	385.0757	-4.19	4.5	C11 H18 O9 N4 Cl

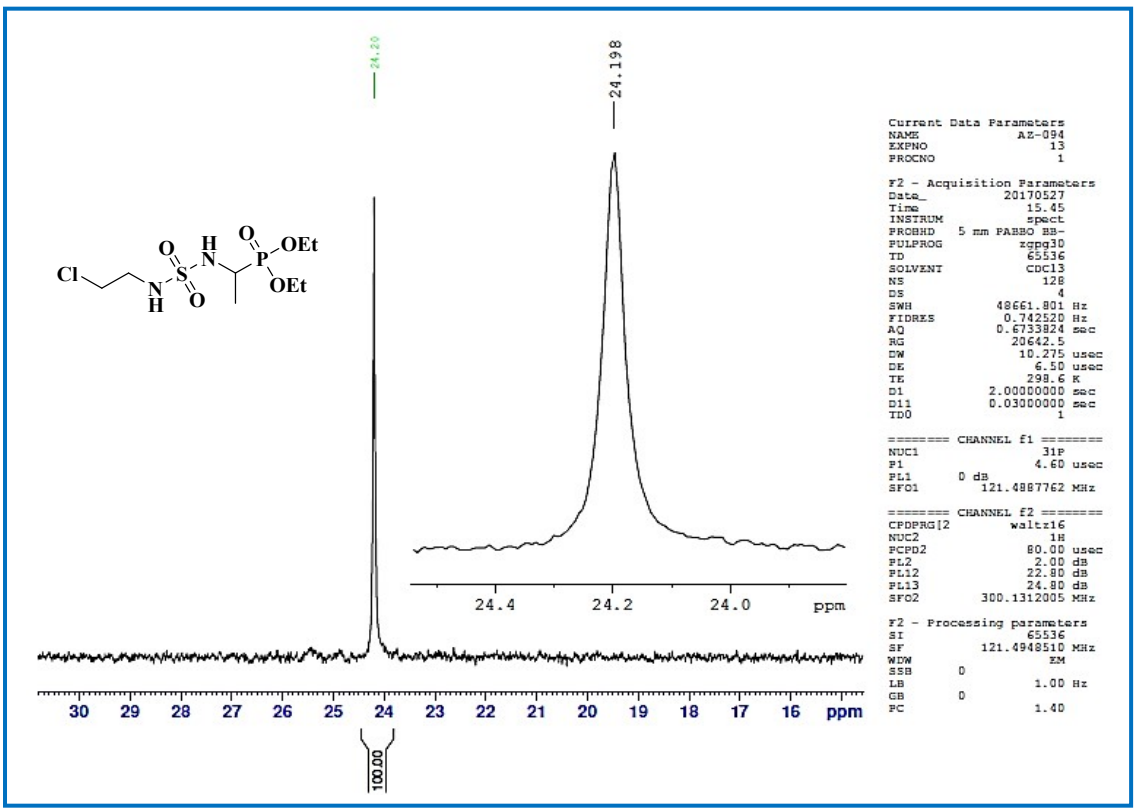
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16a)**



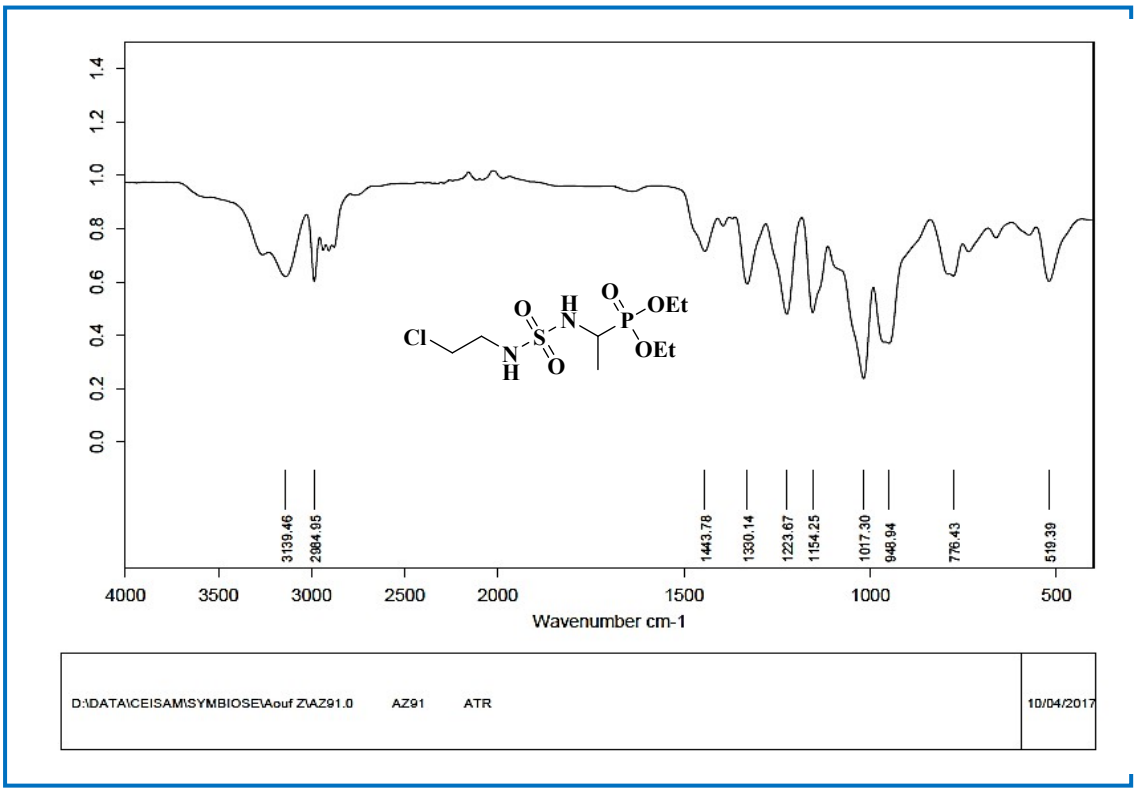
^{1}H NMR Spectrum: *Diethyl (1-((N-(2-chloroethyl)sulfamoyl)amino)ethyl)phosphonate* **(16b)**



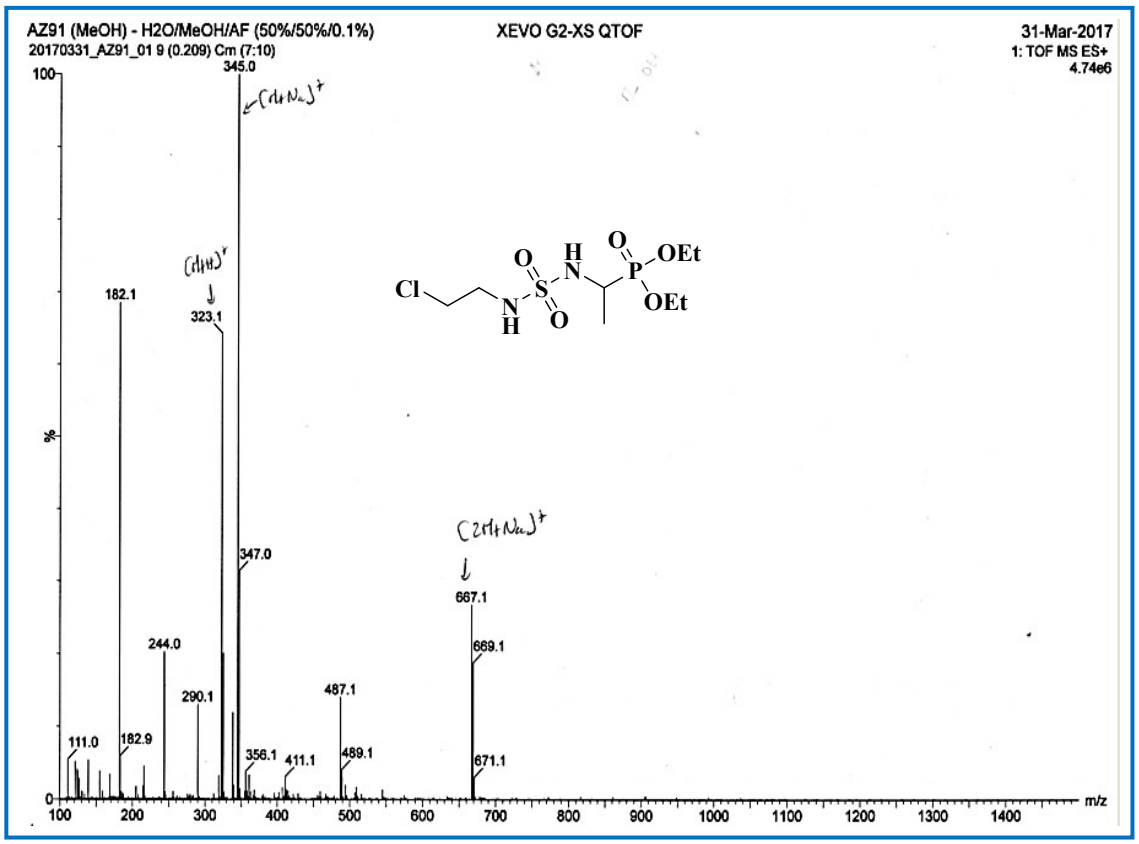
[13]C NMR Spectrum: *Diethyl (1-((N-(2-chloroethyl)sulfamoyl)amino)ethyl)phosphonate* **(16b)**



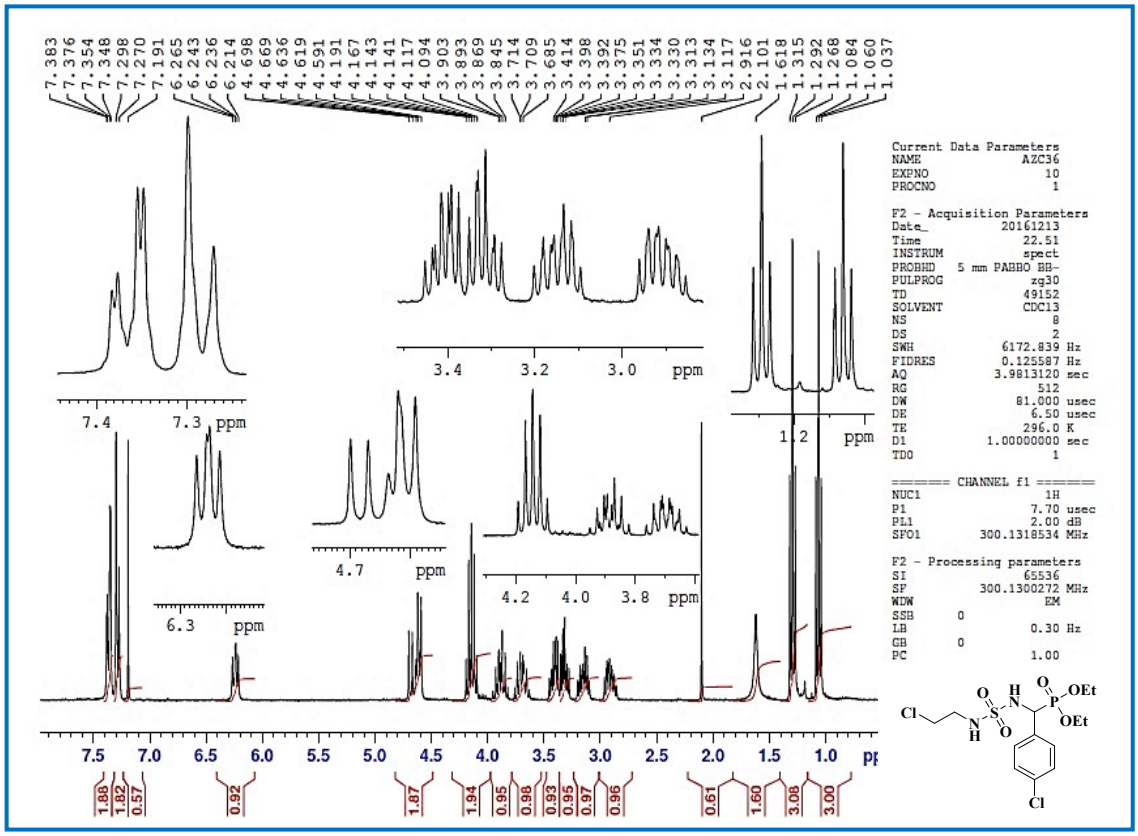
[31]P NMR Spectrum: *Diethyl (1-((N-(2-chloroethyl)sulfamoyl)amino)ethyl)phosphonate* **(16b)**



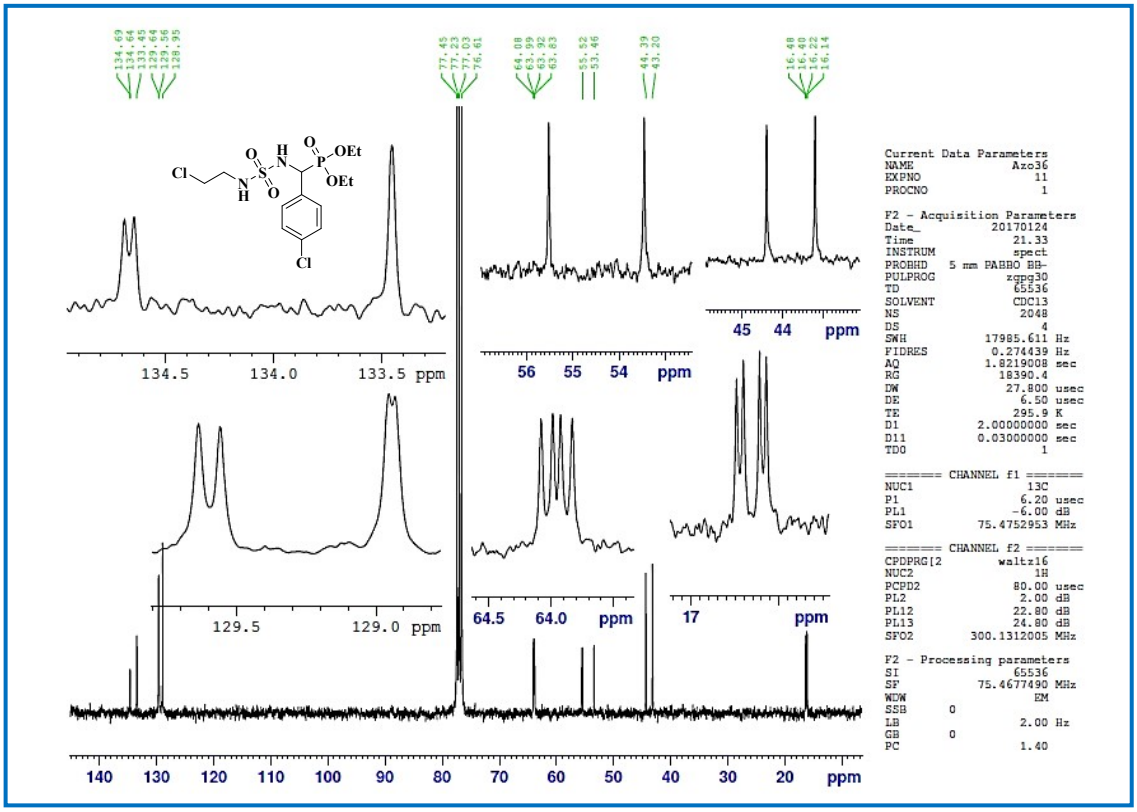
IR Spectrum: *Diethyl (1-((N-(2-chloroethyl)sulfamoyl)amino)ethyl)phosphonate* **(16b)**



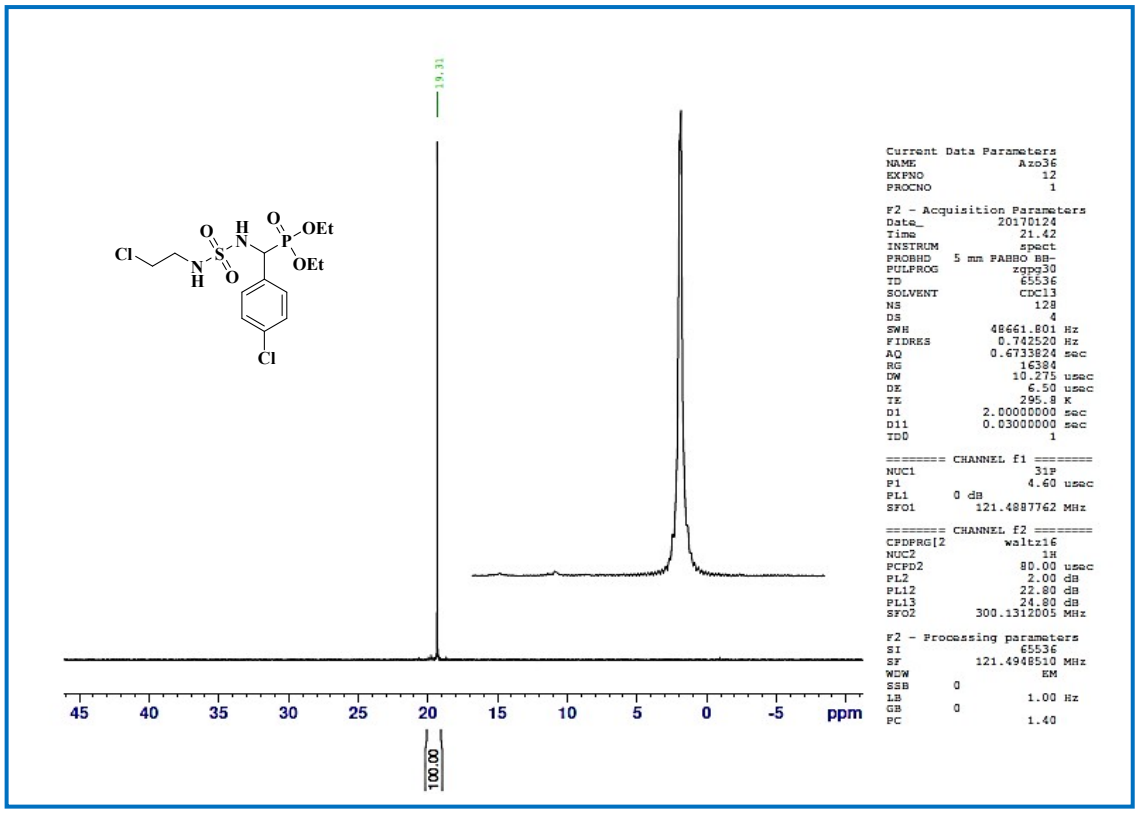
MS Spectrum: *Diethyl (1-((N-(2-chloroethyl)sulfamoyl)amino)ethyl)phosphonate* **(16b)**



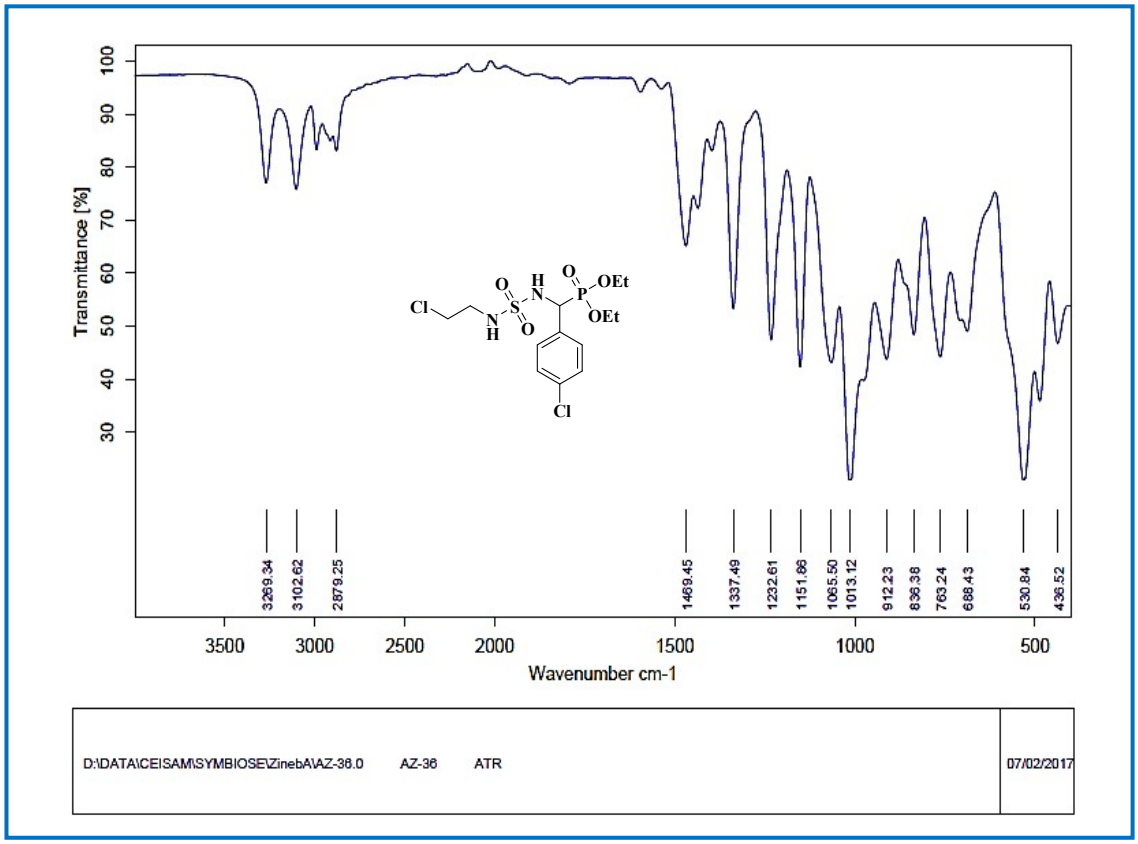
[1]H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-chlorophenyl)methyl)phosphonate* **(16c)**



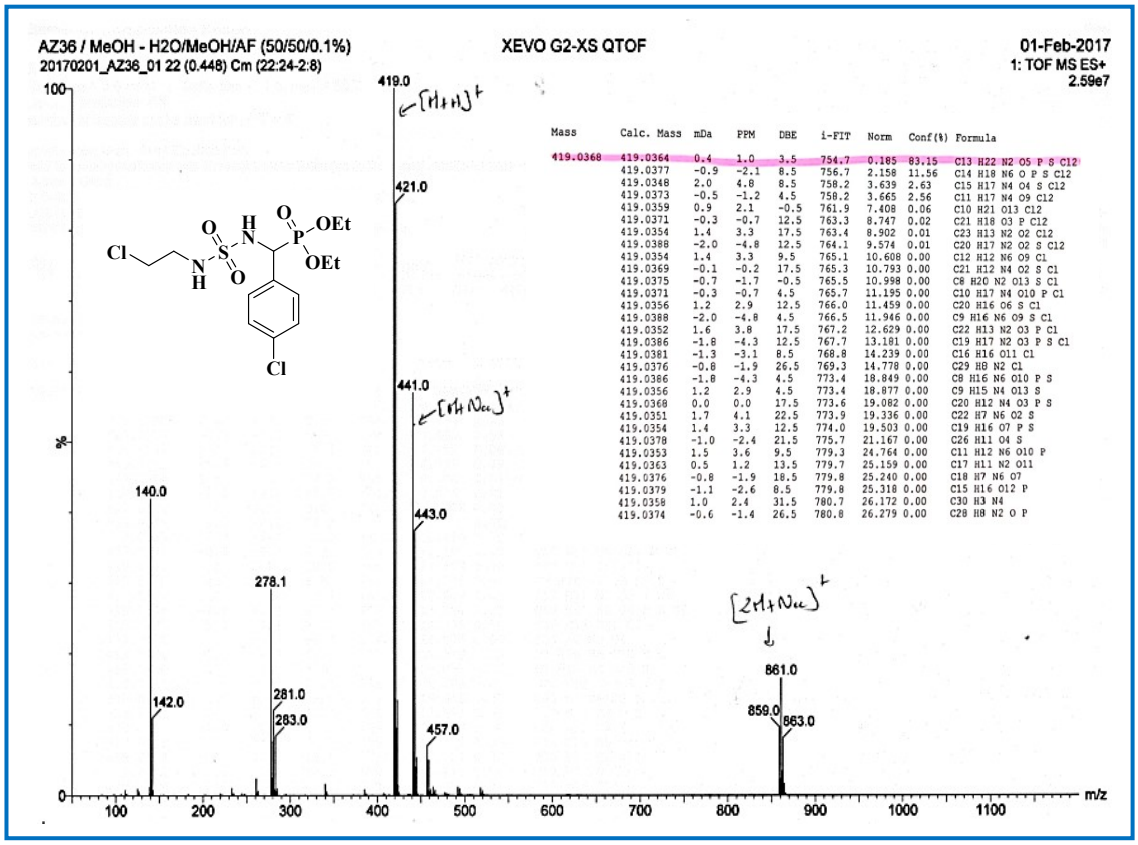
[13]C NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-chlorophenyl)methyl)phosphonate* **(16c)**



^{31}P NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-chlorophenyl)methyl)phosphonate* **(16c)**

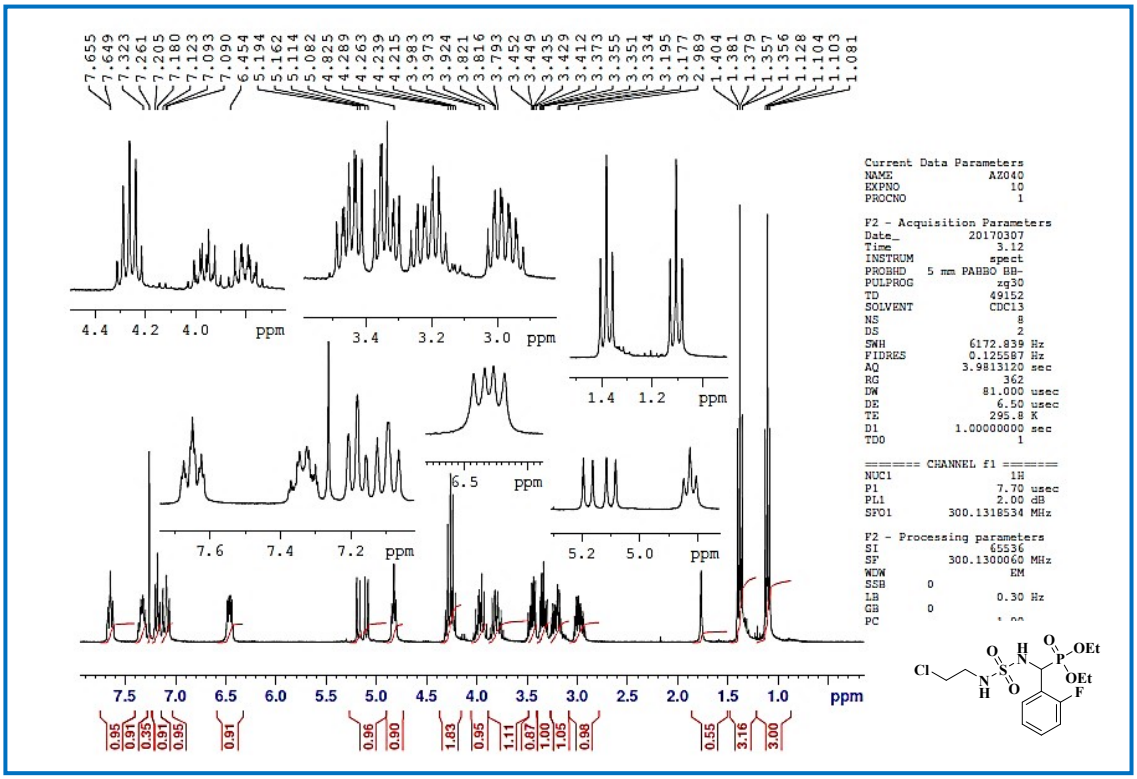


IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-chlorophenyl)methyl)phosphonate* **(16c)**

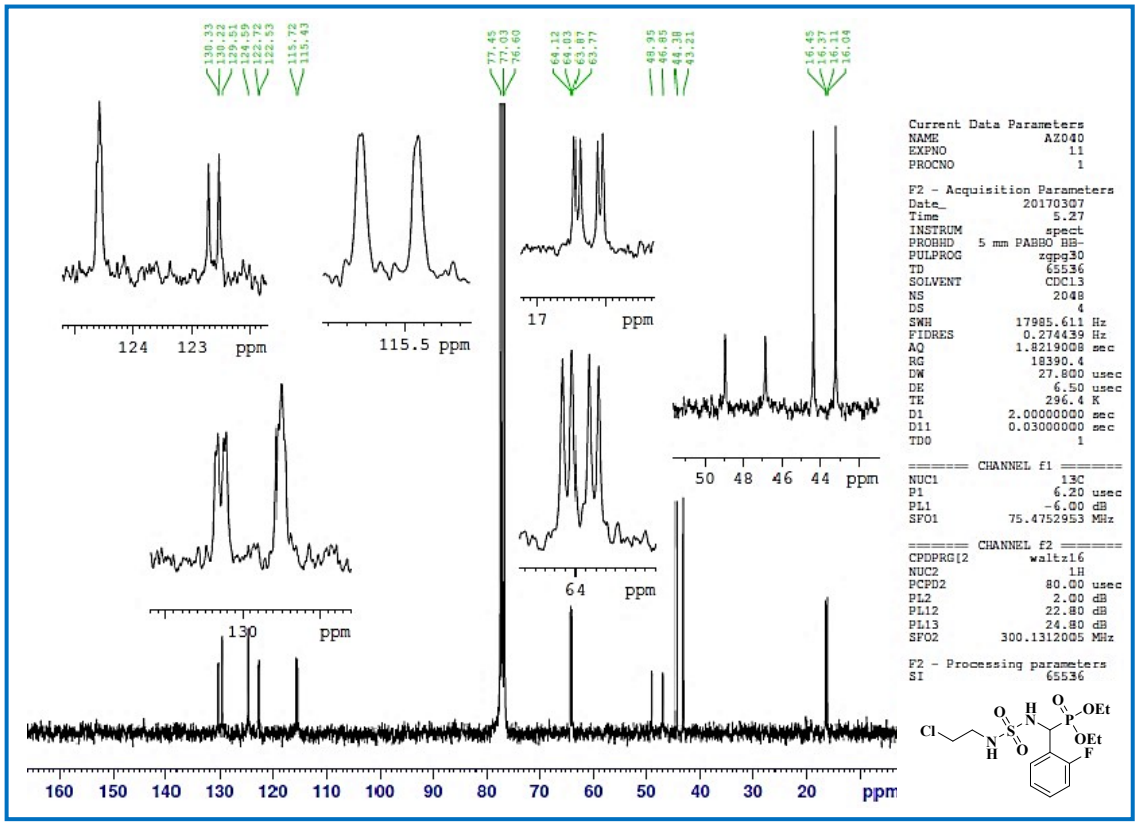


Mass	Calc. Mass	mDa	PPM	DBE	i-FIT	Norm	Conf(%)	Formula
419.0368	419.0364	0.4	1.0	3.5	754.7	0.185	83.15	C13 H22 N2 O5 P S Cl2
	419.0377	-0.9	-2.1	8.5	756.7	2.158	11.56	C14 H18 N6 O P S Cl2
	419.0348	2.0	4.8	8.5	758.2	3.639	2.63	C15 H17 N4 O4 S Cl2
	419.0373	-0.5	-1.2	4.5	758.2	3.665	2.56	C11 H17 N4 O9 Cl2
	419.0359	0.9	2.1	-0.5	761.9	7.408	0.06	C10 H21 O13 Cl2
	419.0371	-0.3	-0.7	12.5	763.3	8.747	0.02	C21 H18 O3 P Cl2
	419.0354	1.4	3.3	17.5	763.4	8.902	0.01	C23 H13 N2 O2 Cl2
	419.0388	-2.0	-4.8	12.5	764.1	9.574	0.01	C20 H17 N2 O2 S Cl2
	419.0354	1.4	3.3	9.5	765.1	10.608	0.00	C12 H12 N6 O9 Cl
	419.0369	-0.1	-0.2	17.5	765.3	10.793	0.00	C21 H12 N4 O2 S Cl
	419.0375	-0.7	-1.7	-0.5	765.5	10.998	0.00	C8 H2C N2 O13 S Cl
	419.0371	-0.3	-0.7	4.5	765.7	11.195	0.00	C10 H17 N4 O10 P Cl
	419.0356	1.2	2.9	12.5	766.0	11.459	0.00	C20 H16 O6 S Cl
	419.0388	-2.0	-4.8	4.5	766.5	11.946	0.00	C9 H16 N6 O9 S Cl
	419.0352	1.6	3.8	17.5	767.2	12.629	0.00	C22 H13 N2 O3 P Cl
	419.0386	-1.8	-4.3	12.5	767.7	13.181	0.00	C19 H17 N2 O3 P S Cl
	419.0381	-1.3	-3.1	8.5	768.8	14.239	0.00	C16 H16 O11 Cl
	419.0376	-0.8	-1.9	26.5	769.3	14.778	0.00	C29 H8 N2 Cl
	419.0386	-1.8	-4.3	4.5	773.4	18.849	0.00	C8 H16 N6 O10 P S
	419.0356	1.2	2.9	4.5	773.4	18.877	0.00	C9 H15 N4 O13 S
	419.0368	0.0	0.0	17.5	773.6	19.082	0.00	C20 H12 N4 O3 P S
	419.0351	1.7	4.1	22.5	773.9	19.336	0.00	C22 H7 N6 O2 S
	419.0354	1.4	3.3	12.5	774.0	19.503	0.00	C19 H16 O7 P S
	419.0378	-1.0	-2.4	21.5	775.7	21.167	0.00	C26 H11 O4 S
	419.0353	1.5	3.6	9.5	779.3	24.764	0.00	C11 H12 N6 O10 P
	419.0363	0.5	1.2	13.5	779.7	25.159	0.00	C17 H11 N2 O11
	419.0376	-0.8	-1.9	18.5	779.8	25.240	0.00	C18 H7 N6 O7
	419.0379	-1.1	-2.6	8.5	779.8	25.318	0.00	C15 H16 O12 P
	419.0358	1.0	2.4	31.5	780.7	26.172	0.00	C30 H3 N4
	419.0374	-0.6	-1.4	26.5	780.8	26.279	0.00	C28 H8 N2 O P

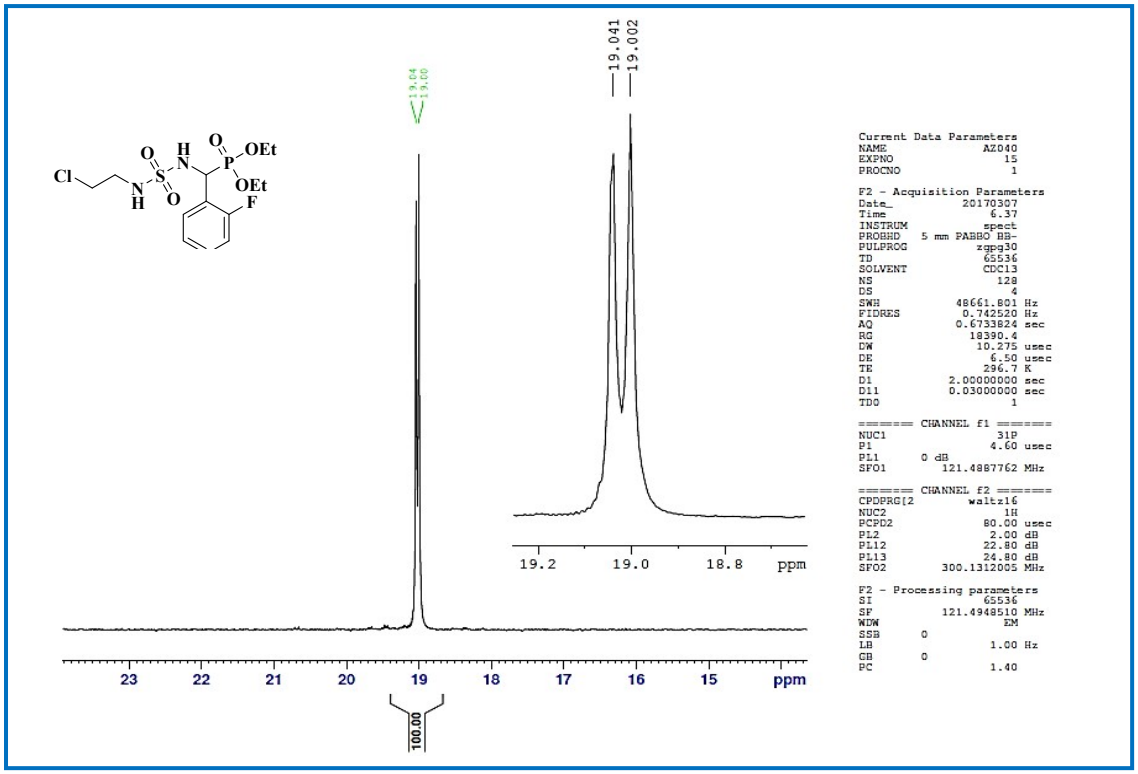
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-chlorophenyl)methyl)phosphonate* **(16c)**



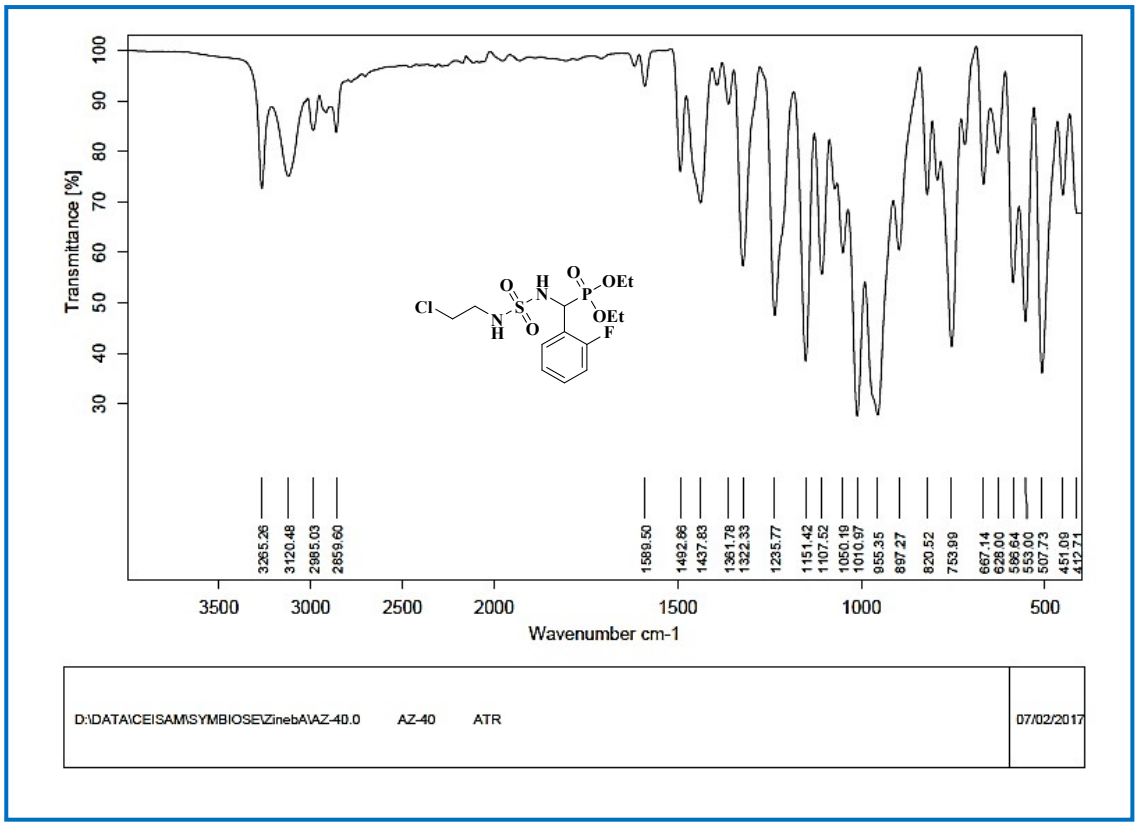
^{1}H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(2-fluorophenyl)methyl)phosphonate* **(16d)**



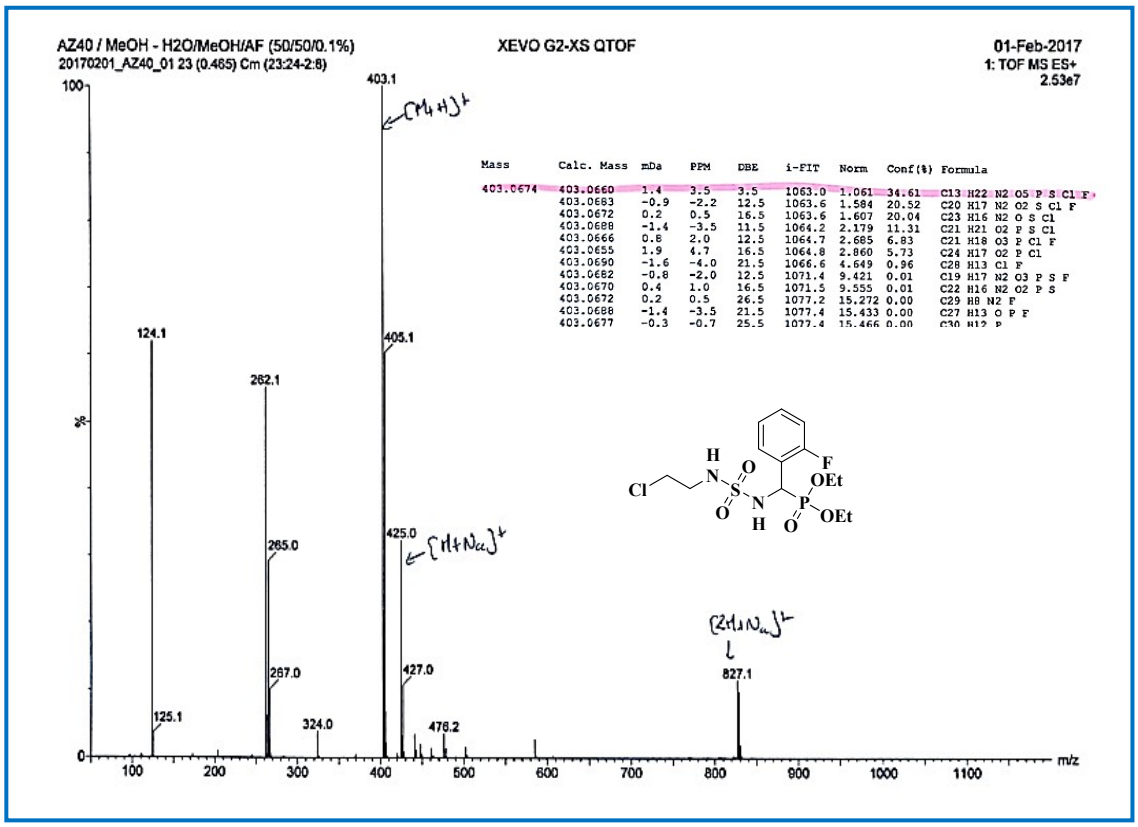
[13]C NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(2-fluorophenyl)methyl)phosphonate*
(16d)



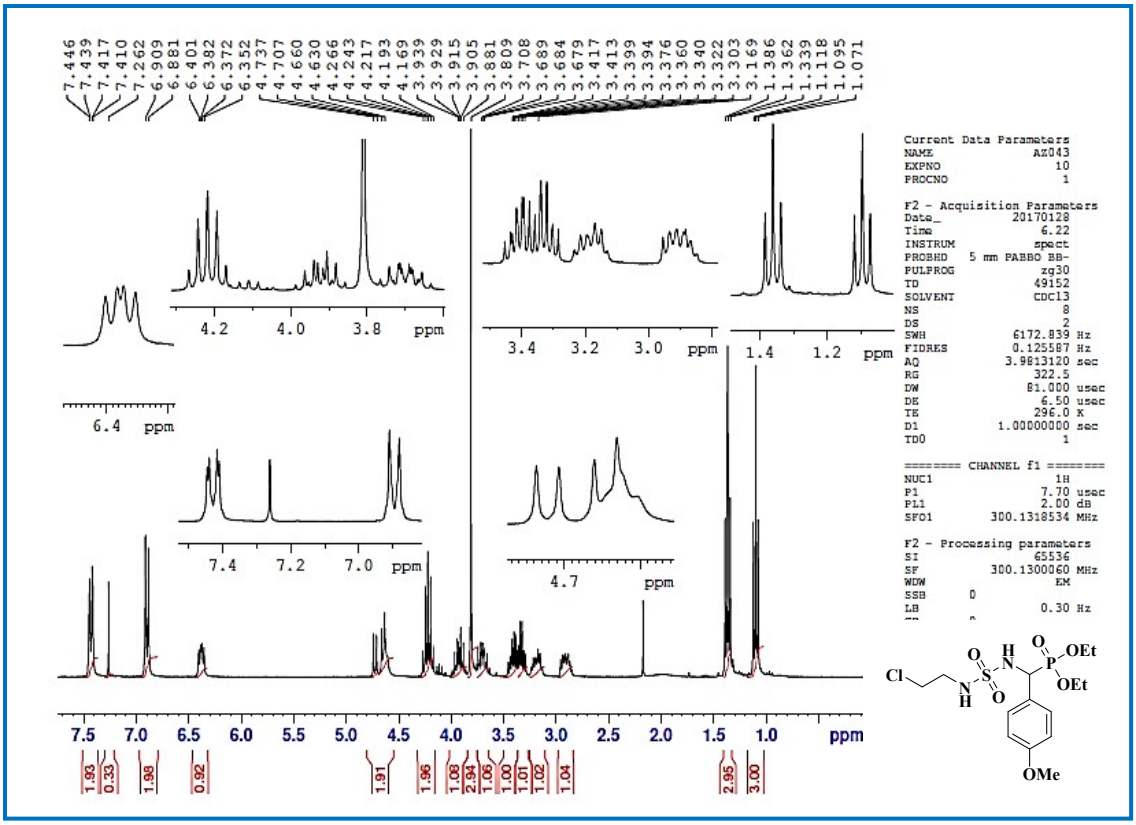
[31]P NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(2-fluorophenyl)methyl)phosphonate*
(16d)



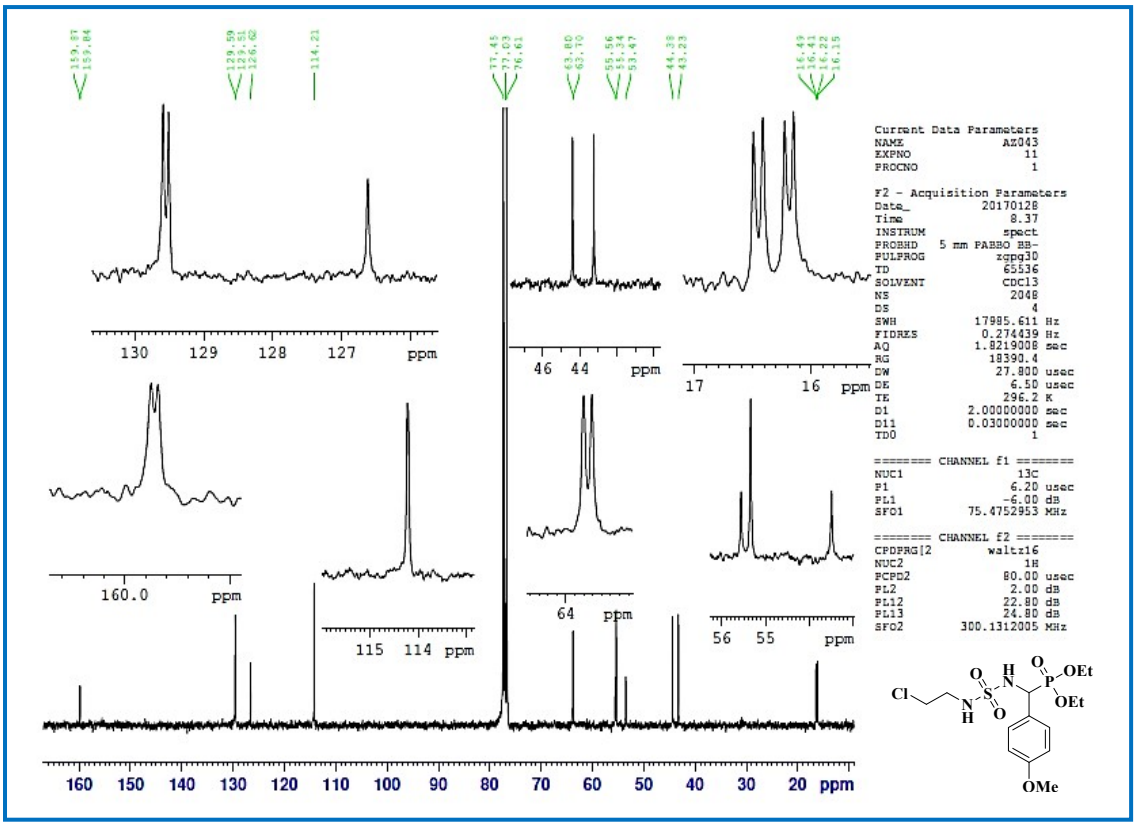
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(2-fluorophenyl)methyl)phosphonate* **(16d)**



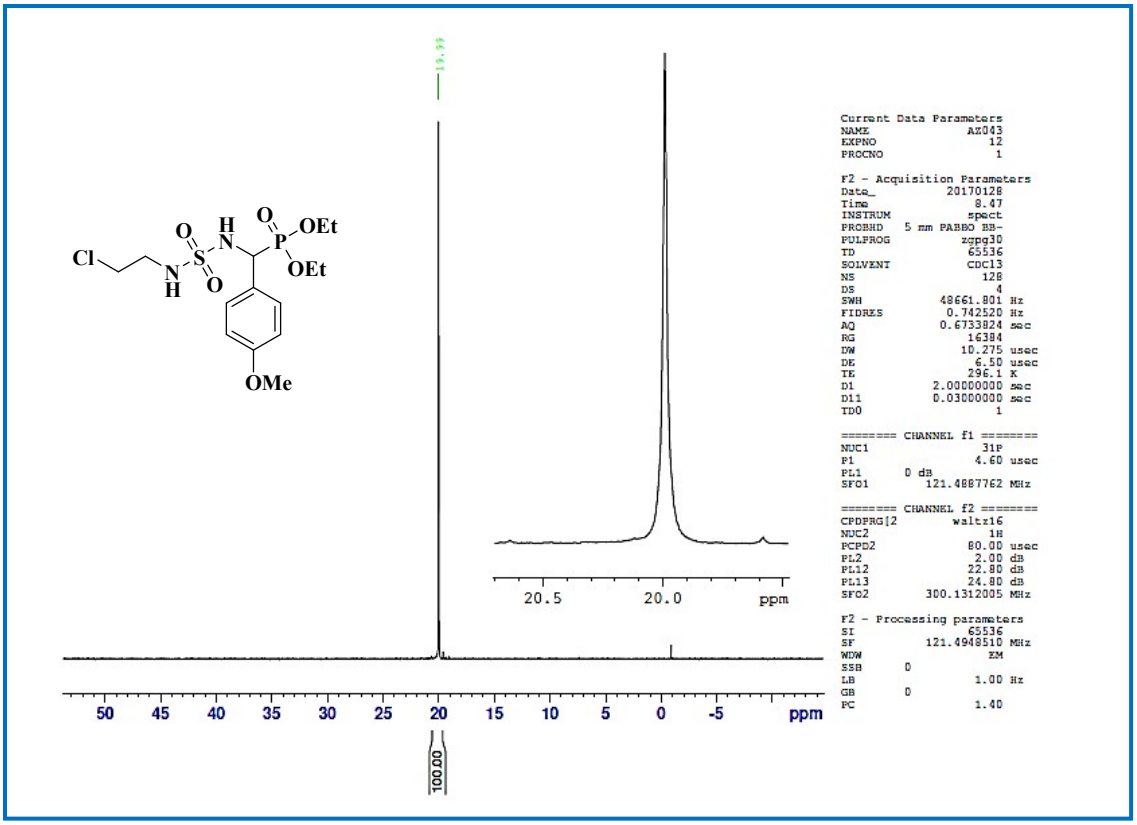
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(2-fluorophenyl)methyl)phosphonate* **(16d)**



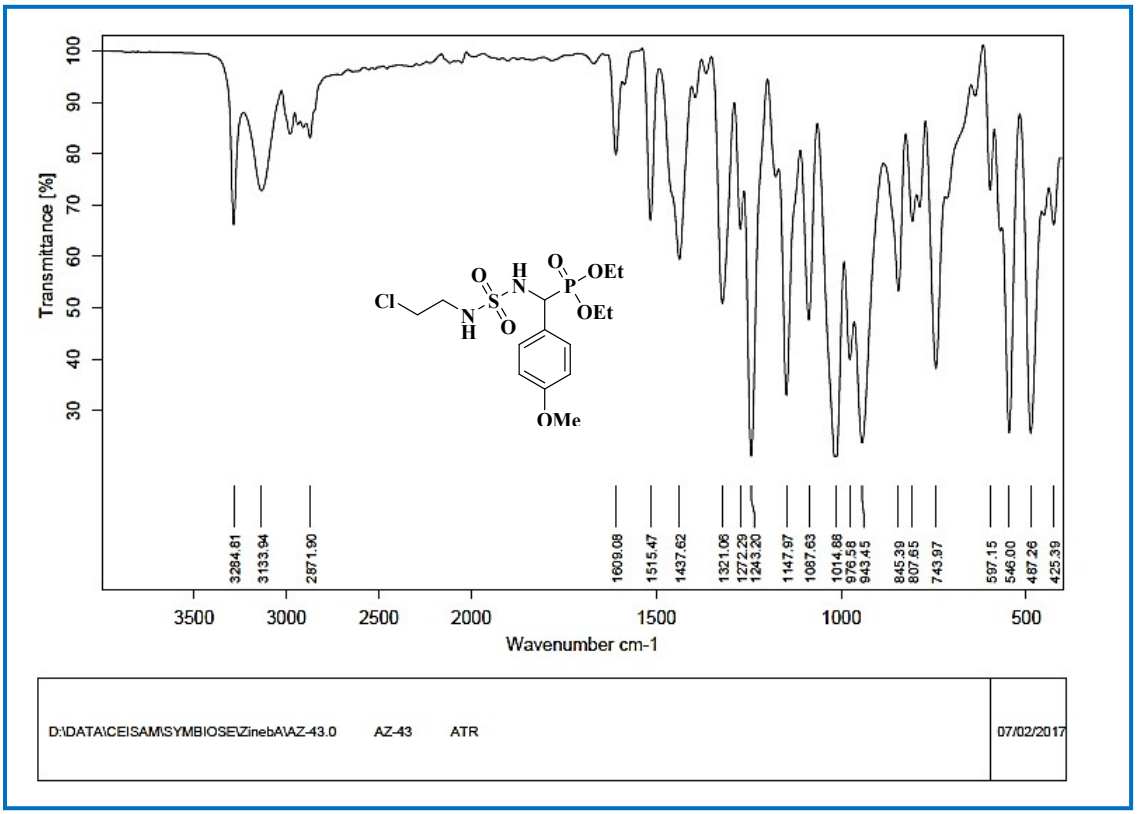
[1]H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-methoxyphenyl)methyl)phosphonate* **(16e)**



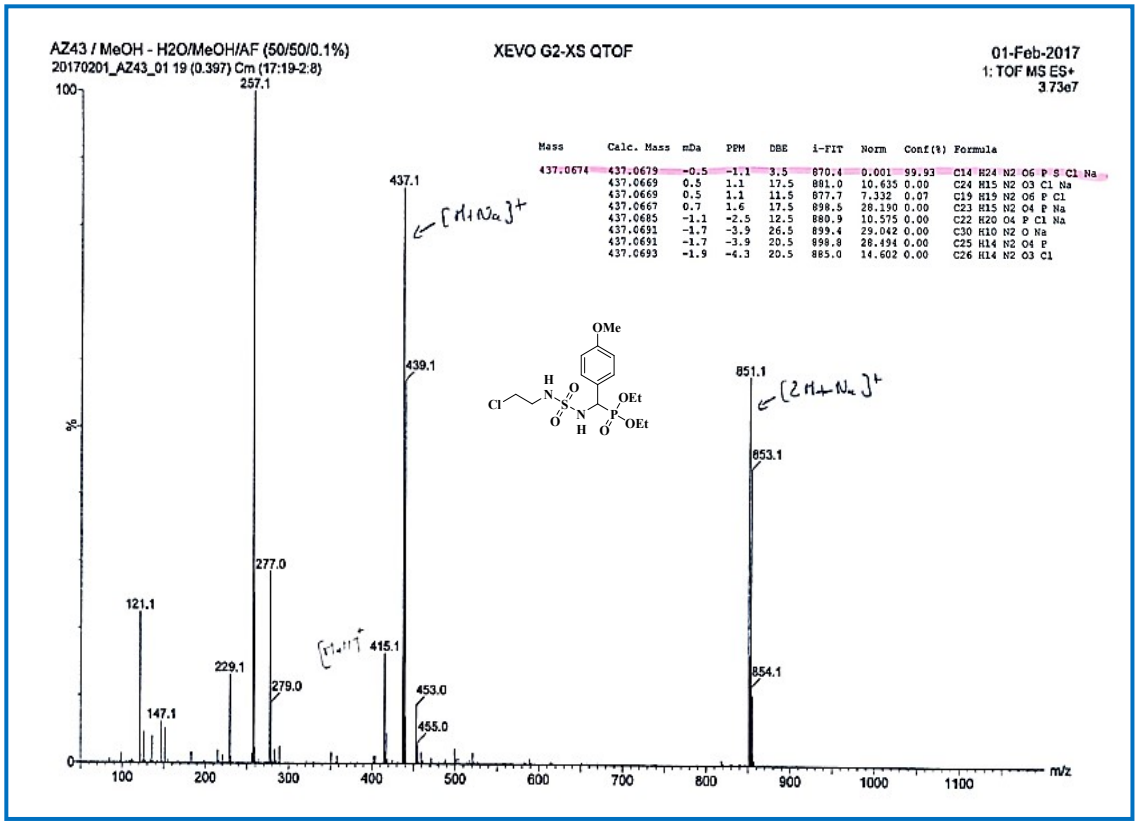
[13]C NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-methoxyphenyl)methyl)phosphonate* **(16e)**



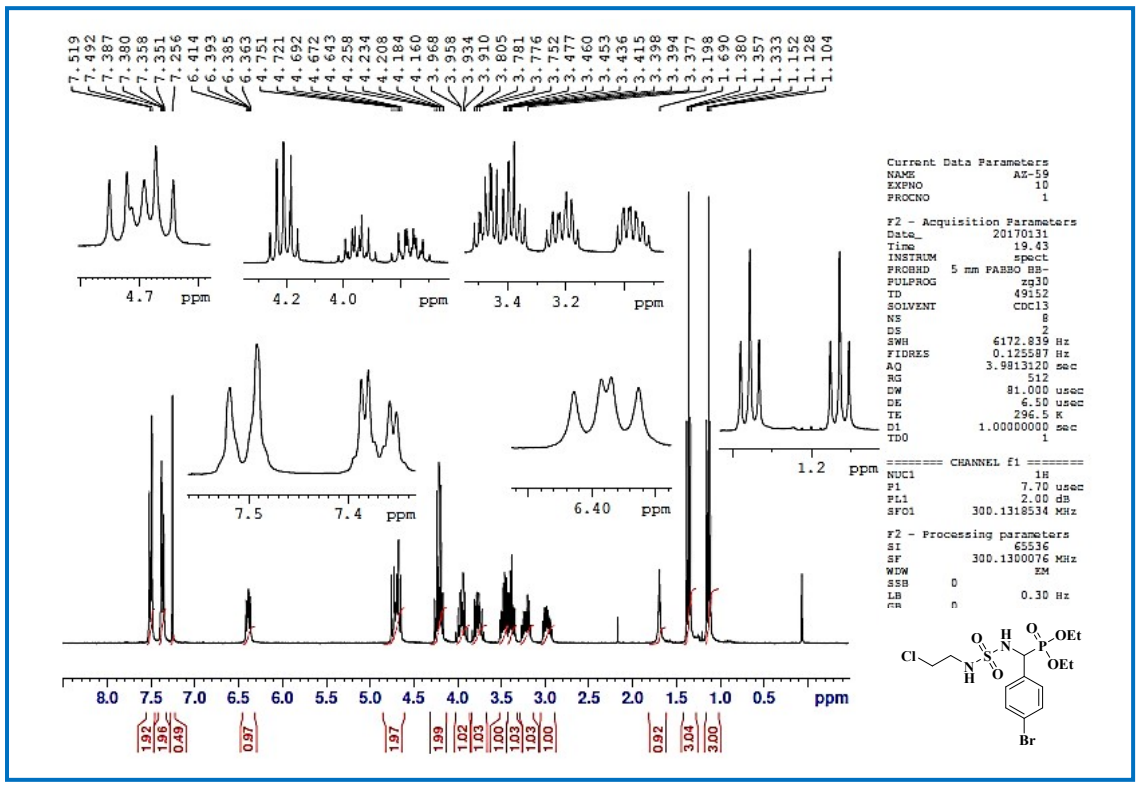
[31]P NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-methoxyphenyl)methyl)phosphonate* **(16e)**



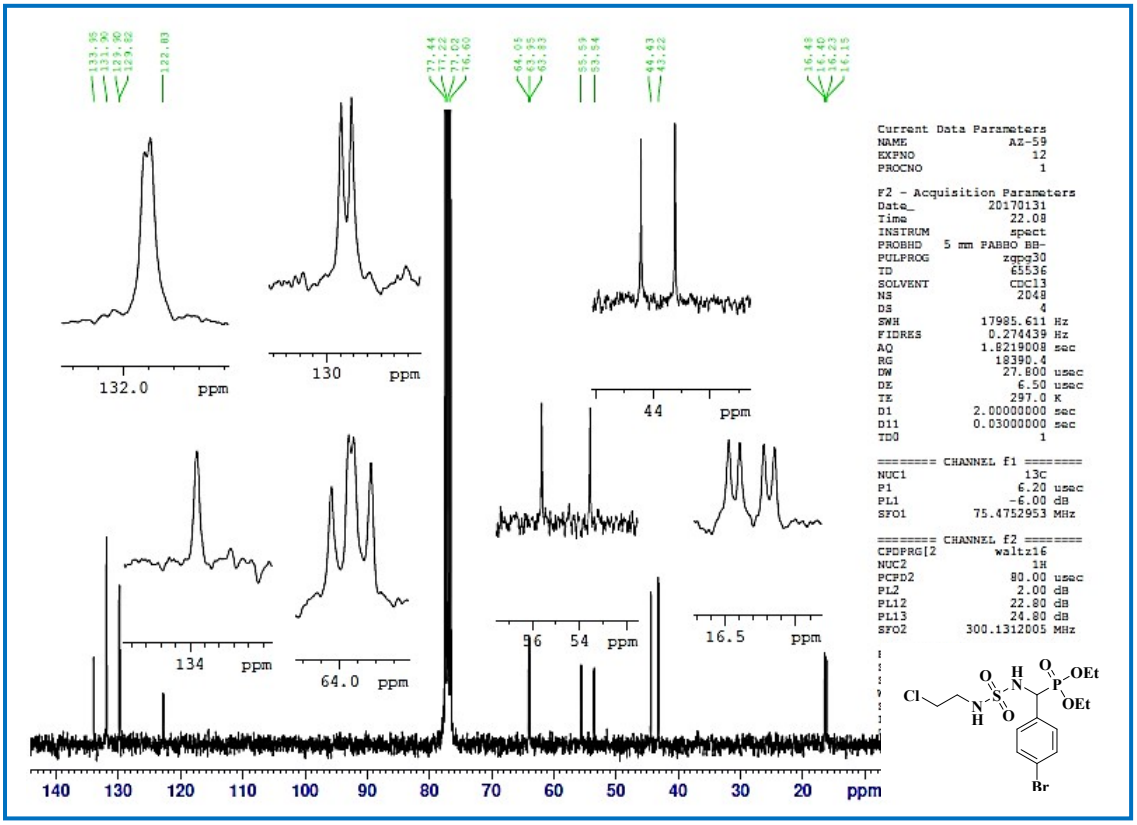
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-methoxyphenyl)methyl)phosphonate* **(16e)**



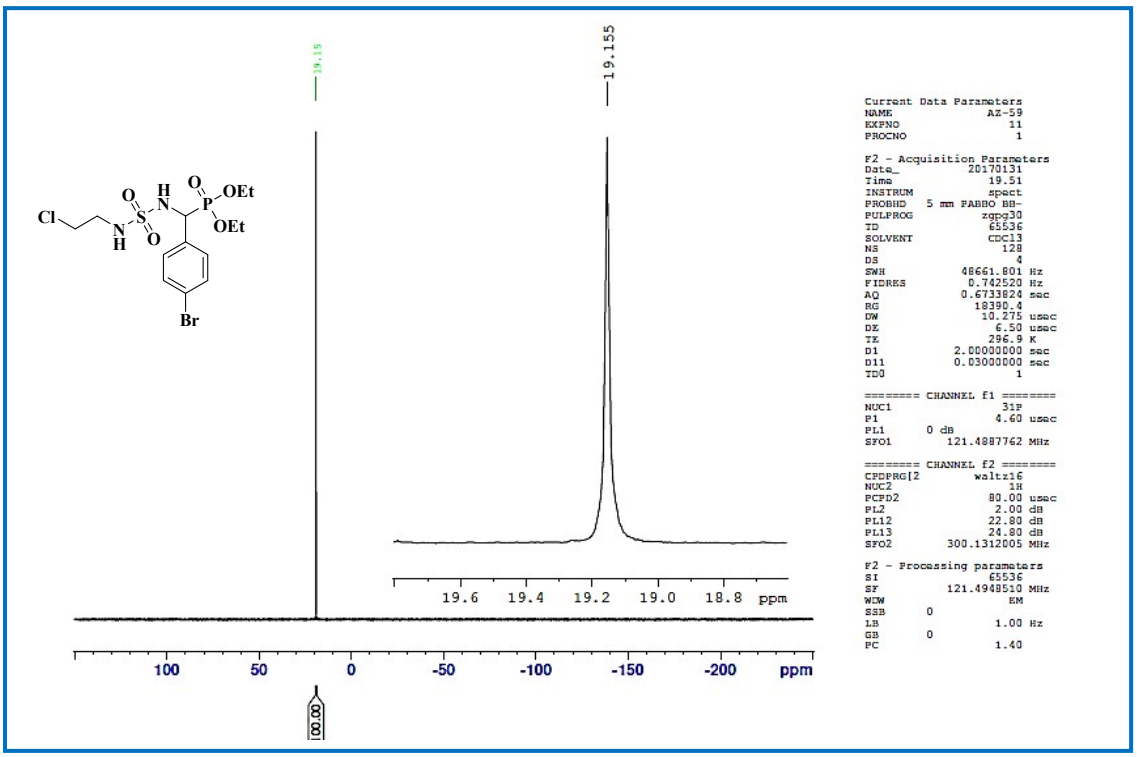
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-methoxyphenyl)methyl)phosphonate* **(16e)**



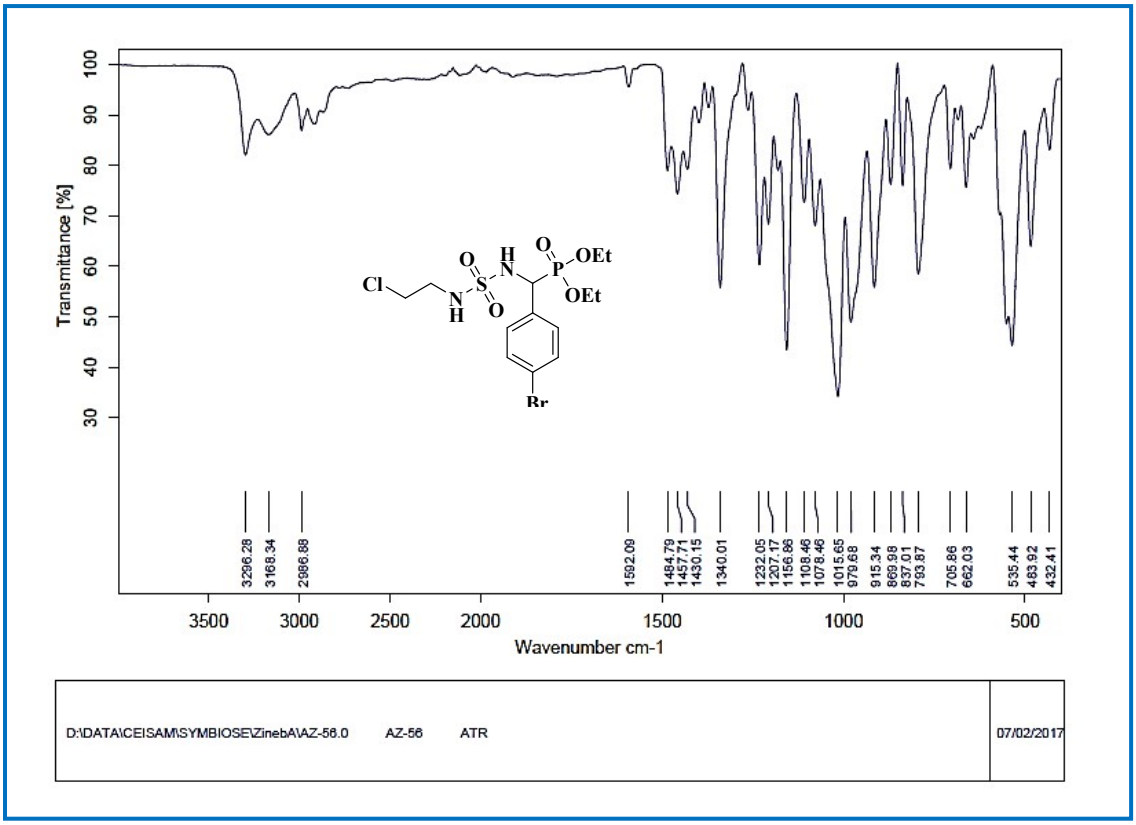
^{1}***H NMR Spectrum:*** *Diethyl ((4-bromophenyl)((N-(2-chloroethyl)sulfamoyl)amino)methyl)phosphonate* **(16f)**



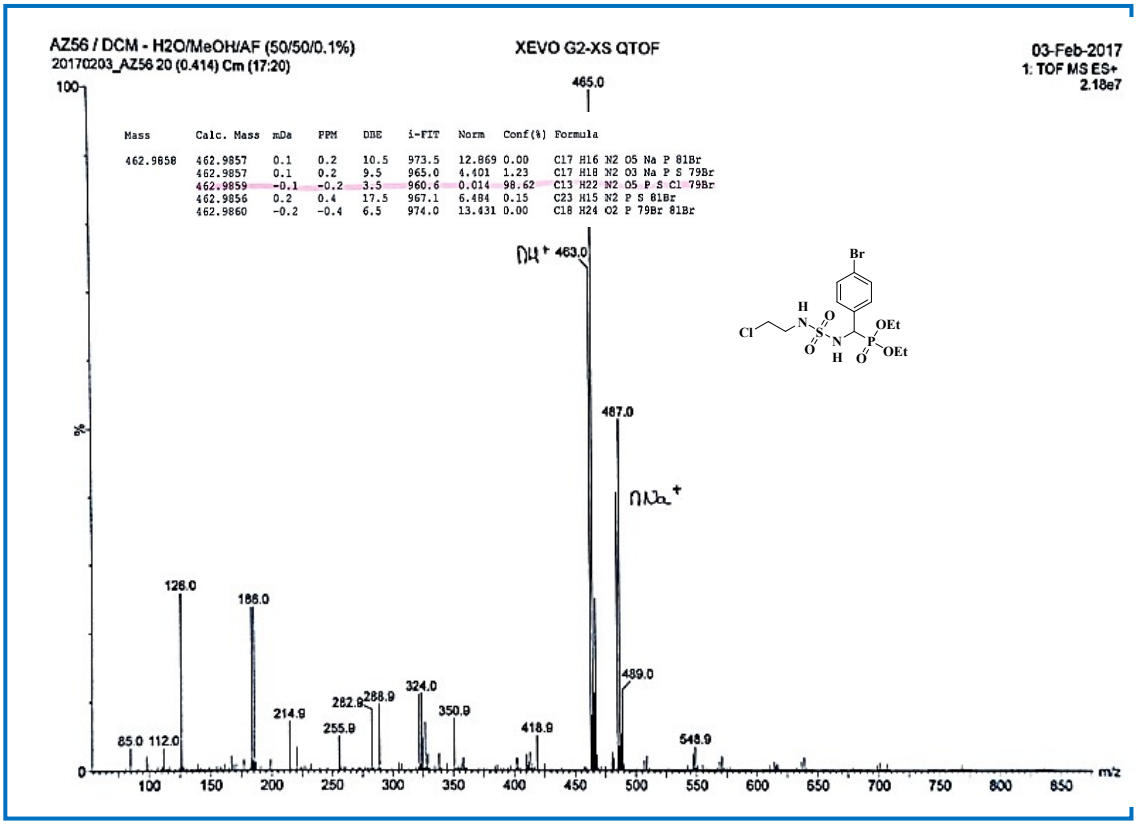
*[13]**C NMR Spectrum:** Diethyl ((4-bromophenyl)((N-(2-chloroethyl)sulfamoyl)amino)methyl)phosphonate* **(16f)**



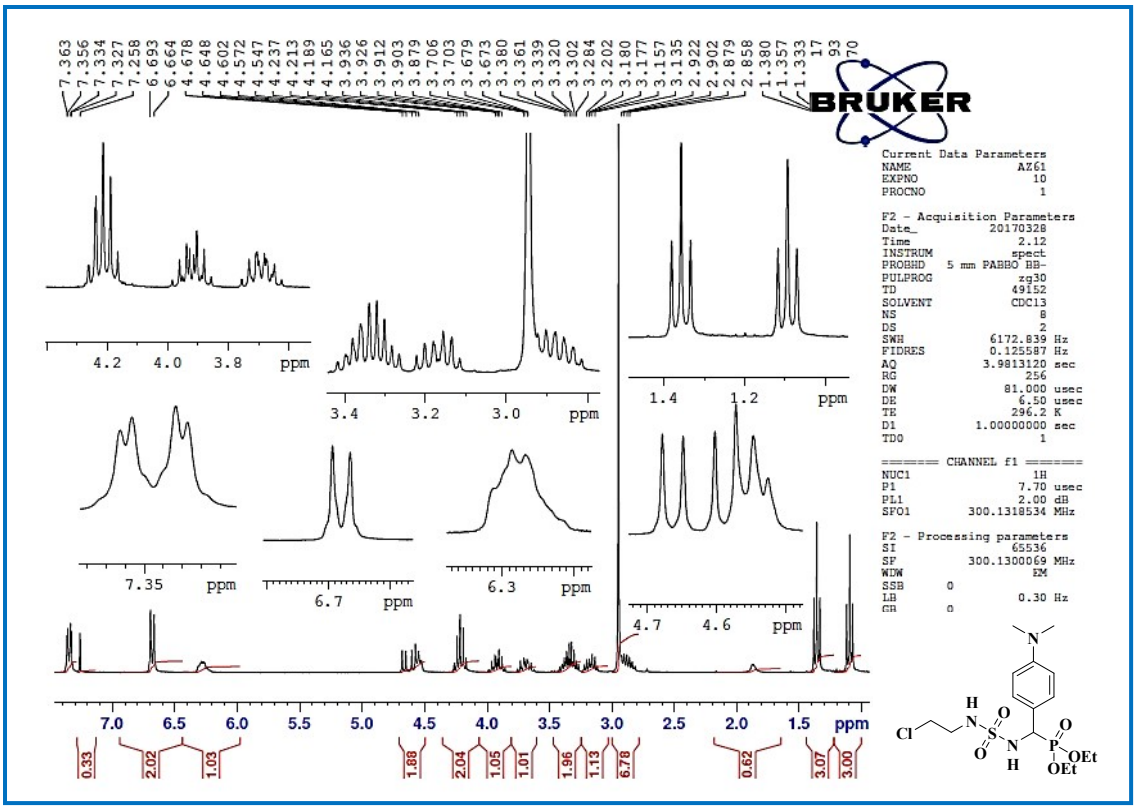
*[31]**P NMR Spectrum:** Diethyl ((4-bromophenyl)((N-(2-chloroethyl)sulfamoyl)amino)methyl)phosphonate* **(16f)**



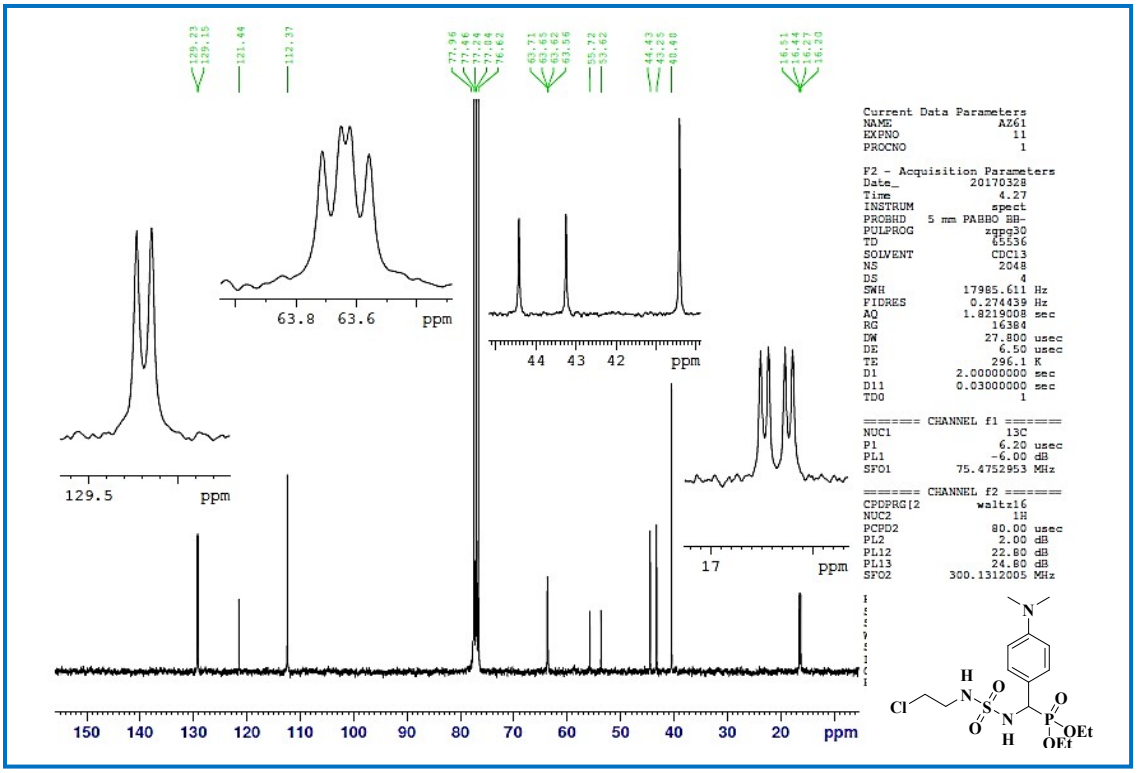
IR Spectrum: *Diethyl ((4-bromophenyl)((N-(2-chloroethyl)sulfamoyl)amino)methyl)phosphonate* **(16f)**



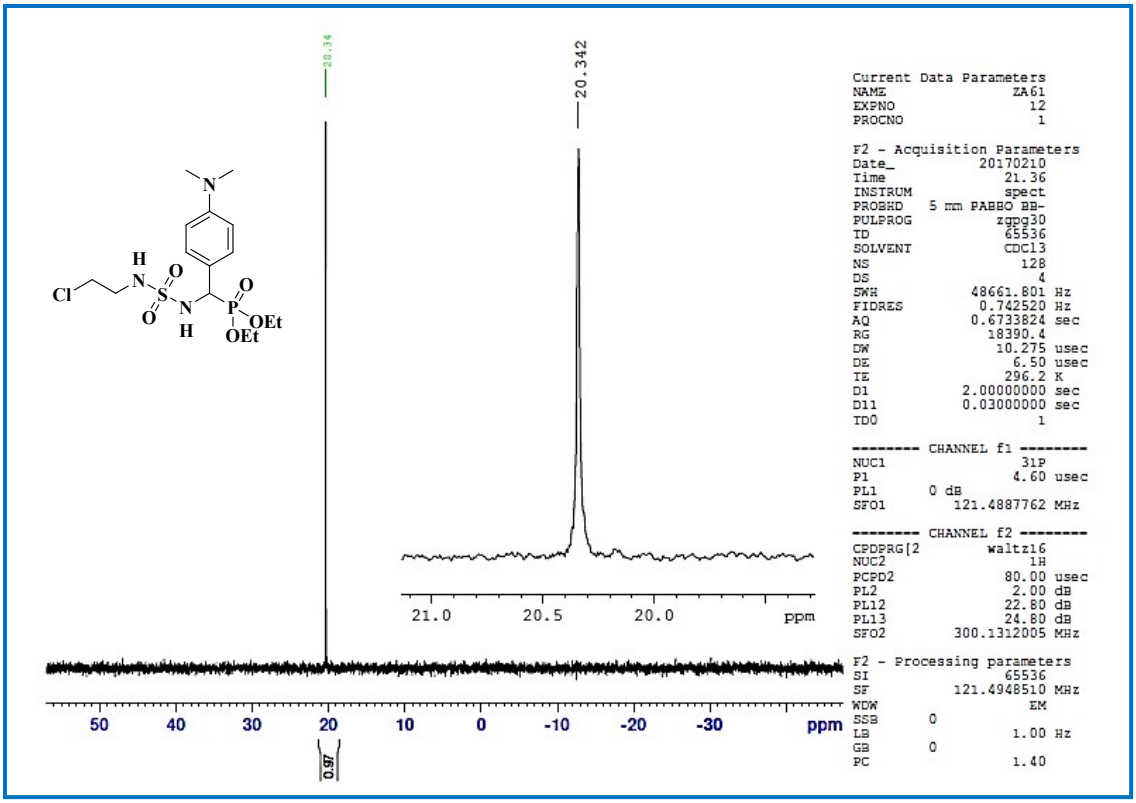
MS Spectrum: *Diethyl ((4-bromophenyl)((N-(2-chloroethyl)sulfamoyl)amino)methyl)phosphonate* **(16f)**



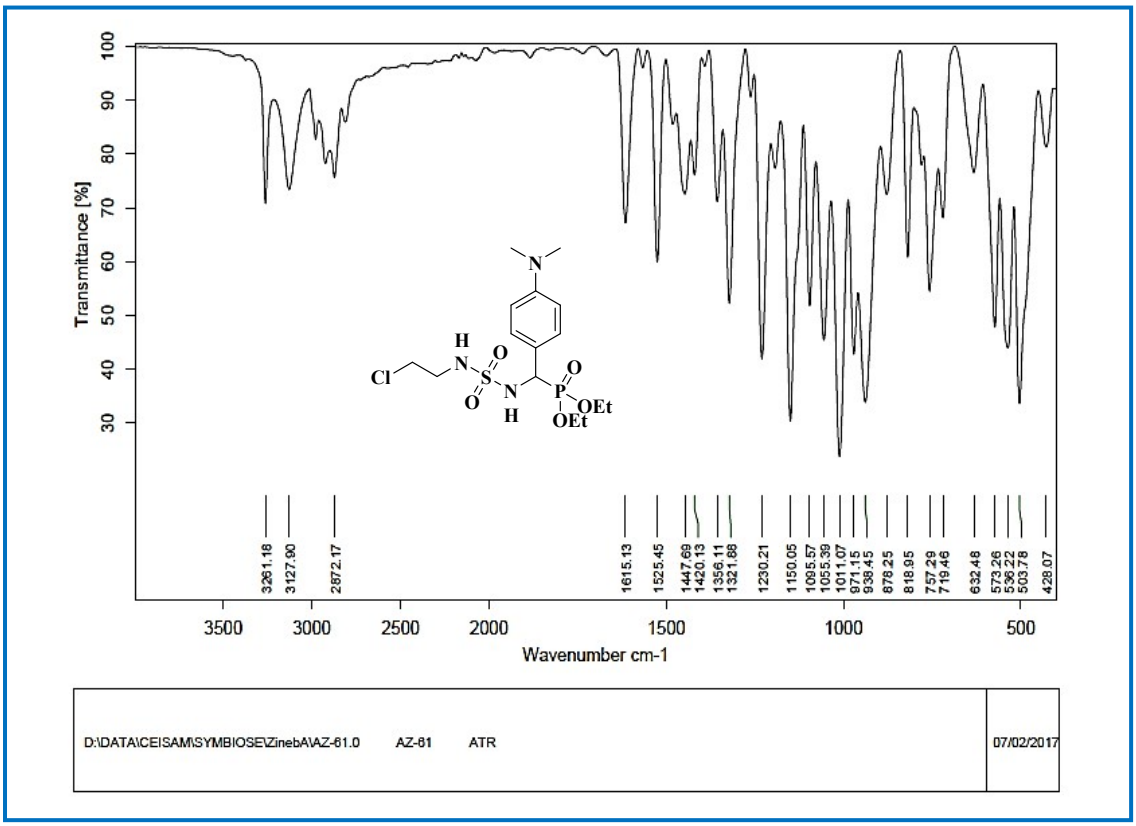
[1]H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(dimethylamino)phenyl)methyl)phosphonate* **(16g)**



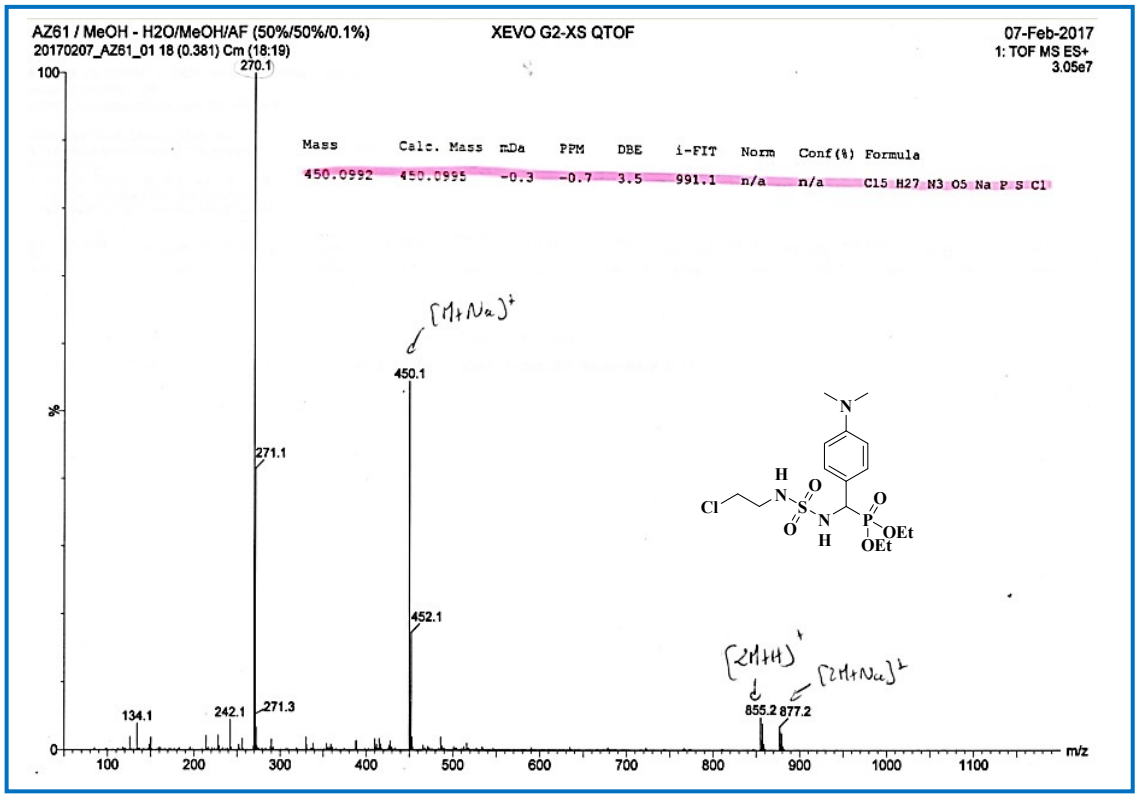
[13]C NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(dimethylamino)phenyl)methyl)phosphonate* **(16g)**



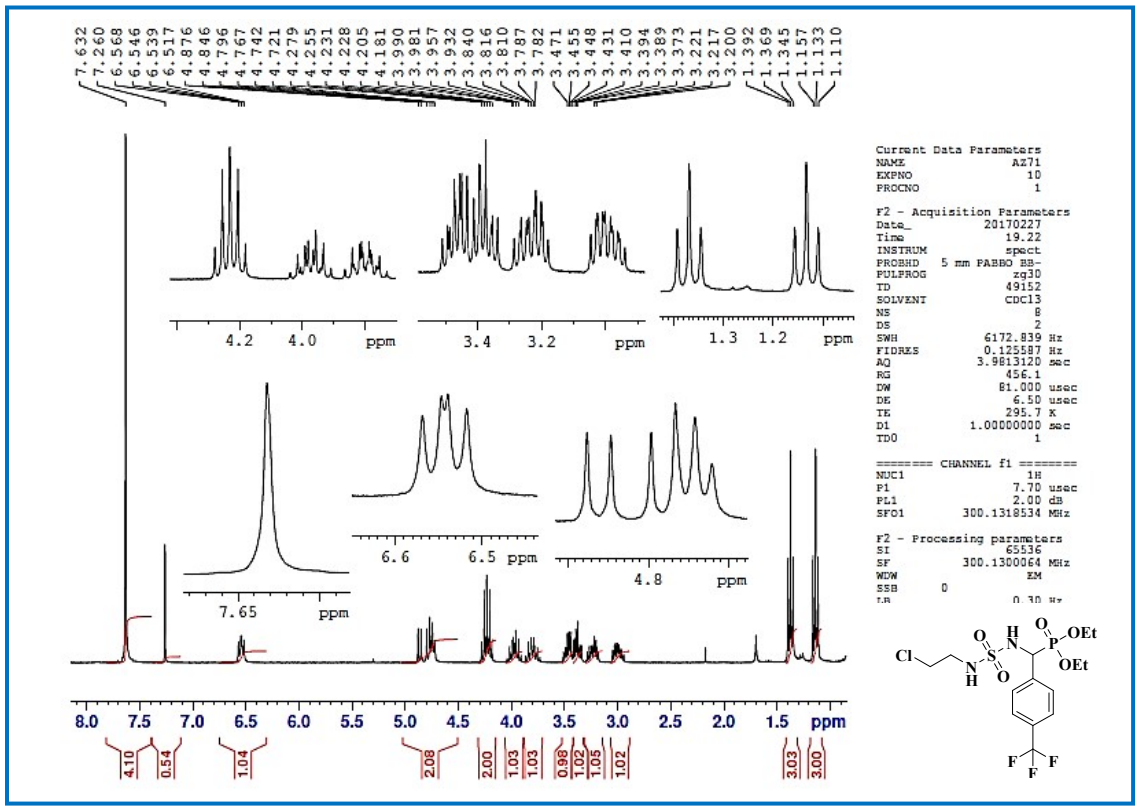
^{31}P NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(dimethylamino)phenyl)methyl)phosphonate* **(16g)**



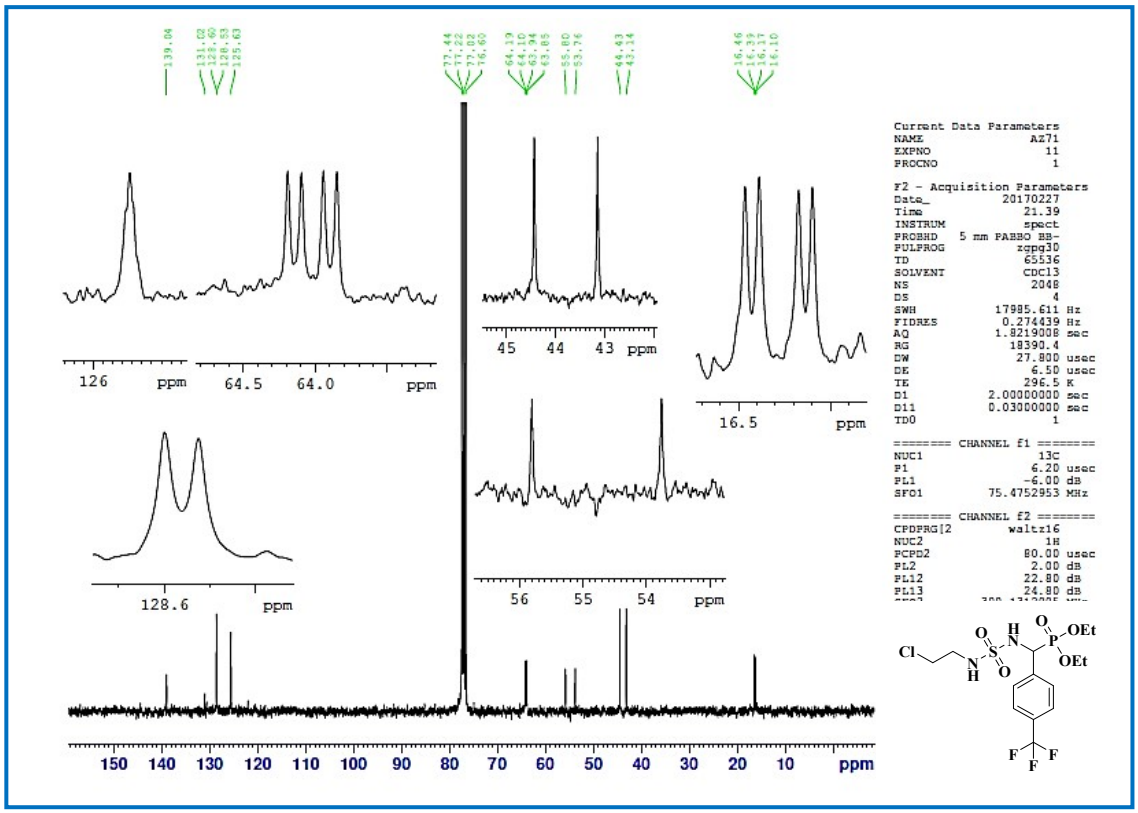
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(dimethylamino)phenyl)methyl)phosphonate* **(16g)**



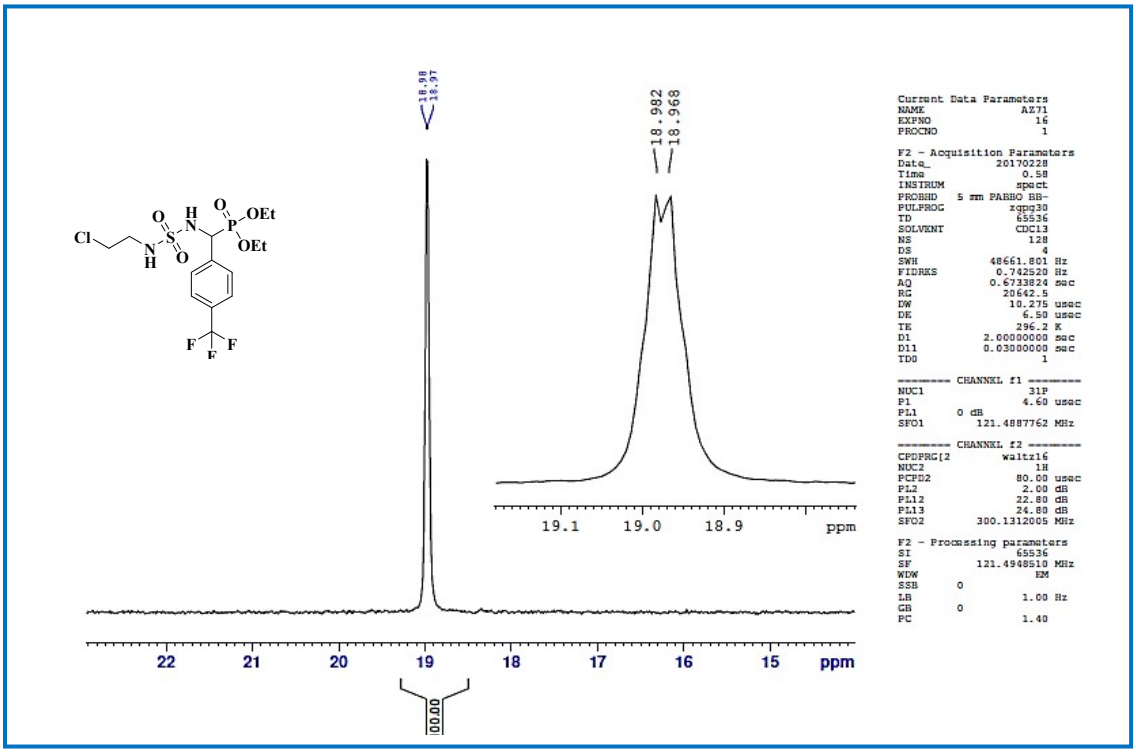
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(dimethylamino)phenyl)methyl)phosphonate* **(16g)**



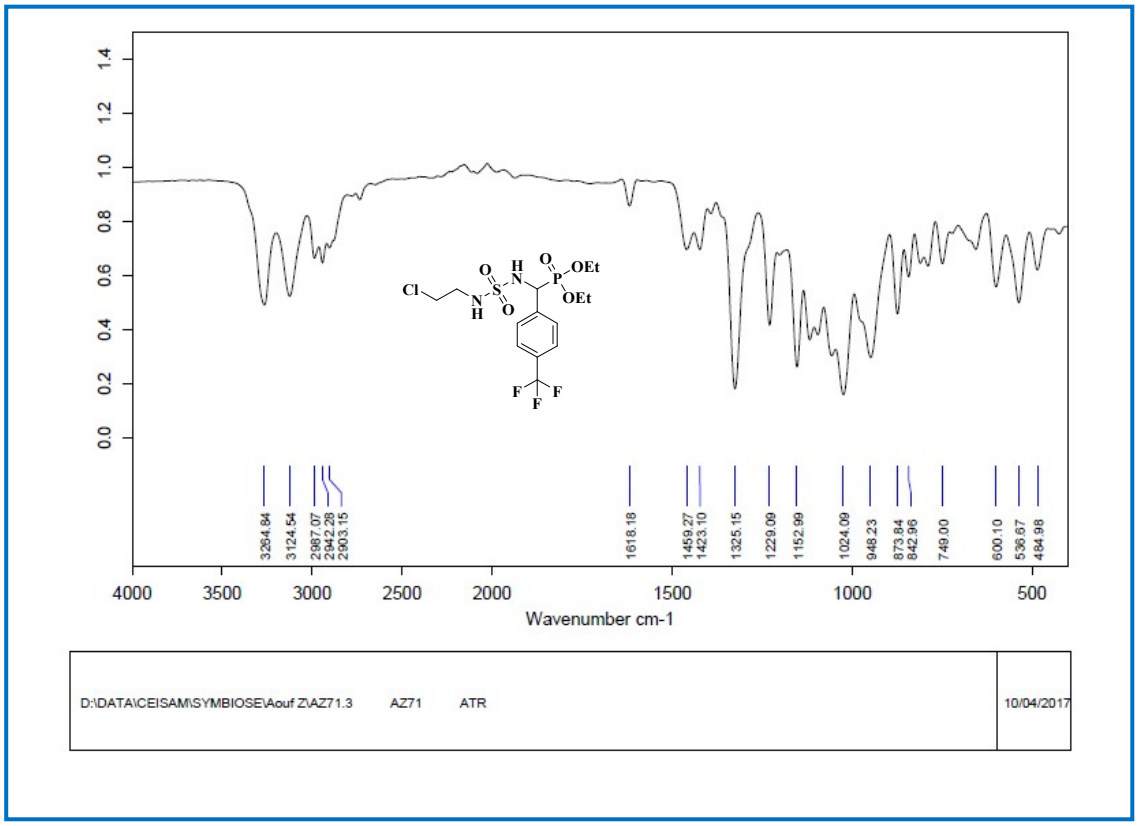
^{1}H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(trifluoromethyl)phenyl)methyl)phosphonate* **(16h)**



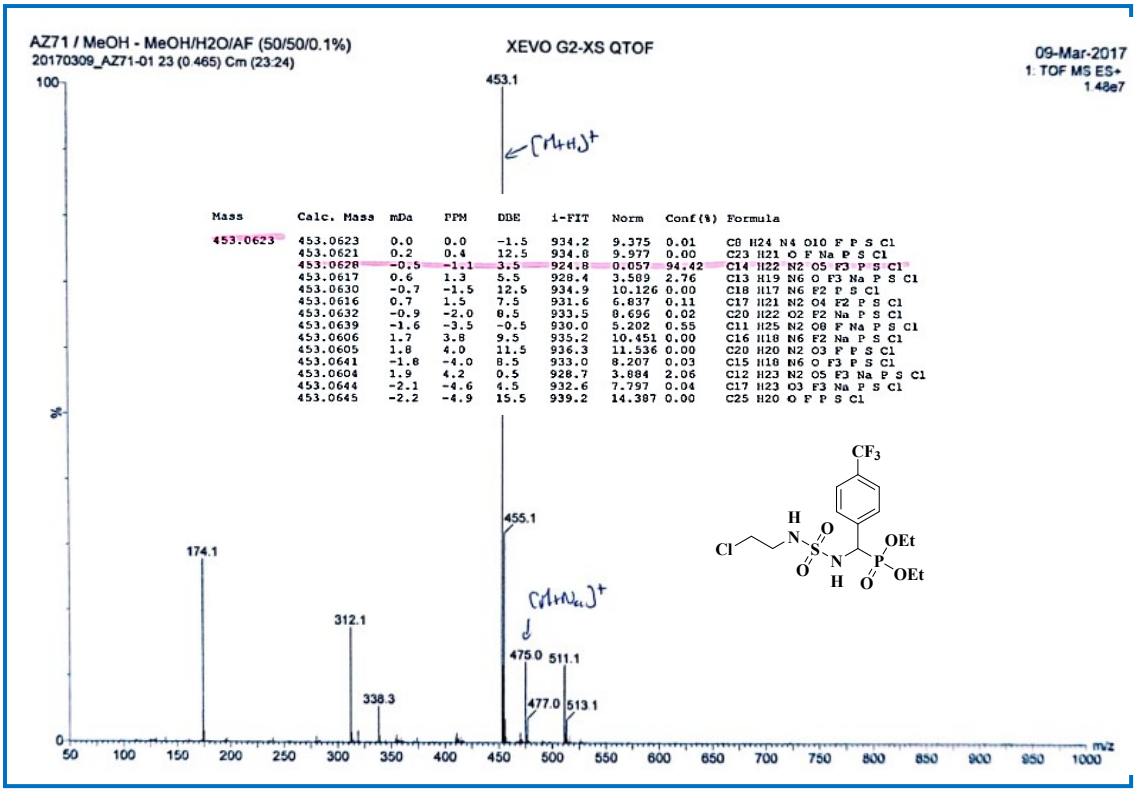
*[13]**C NMR Spectrum:** Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(trifluoromethyl)phenyl)methyl)phosphonate* **(16h)**



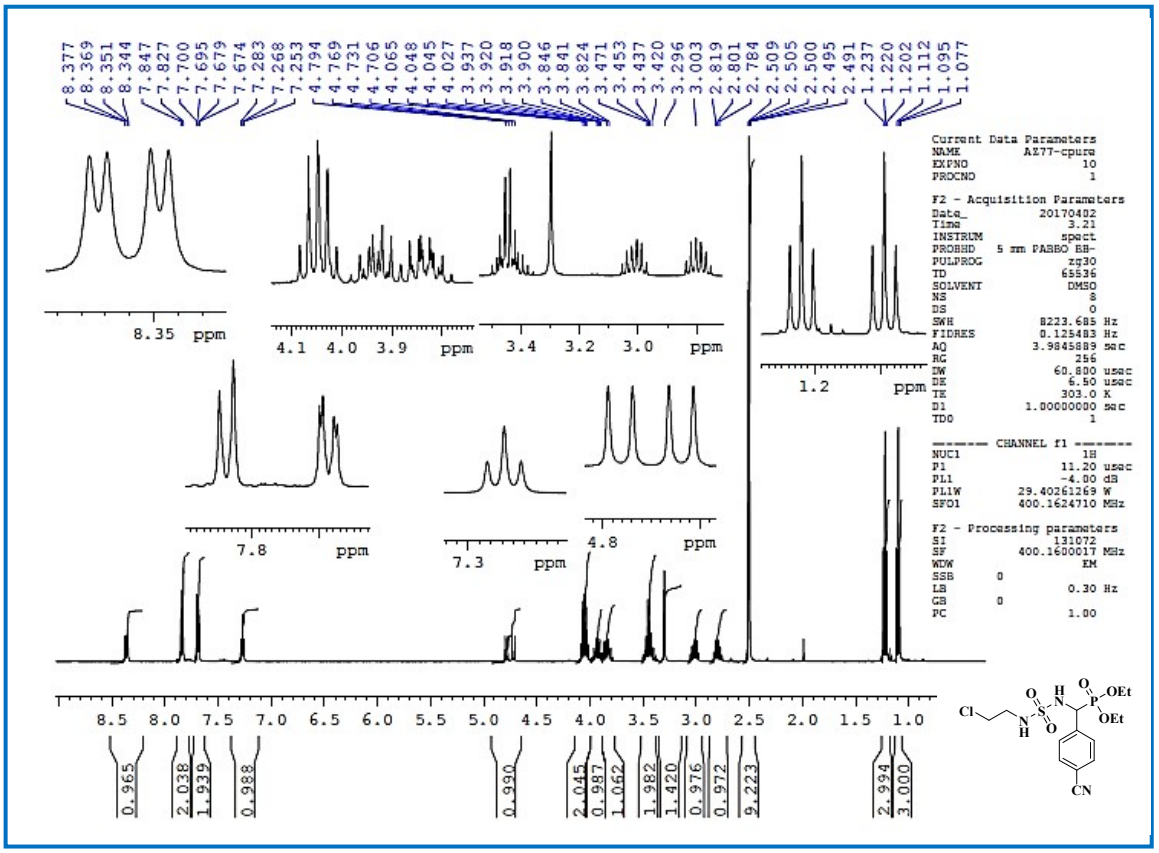
*[31]**P NMR Spectrum:** Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(trifluoromethyl)phenyl)methyl)phosphonate* **(16h)**



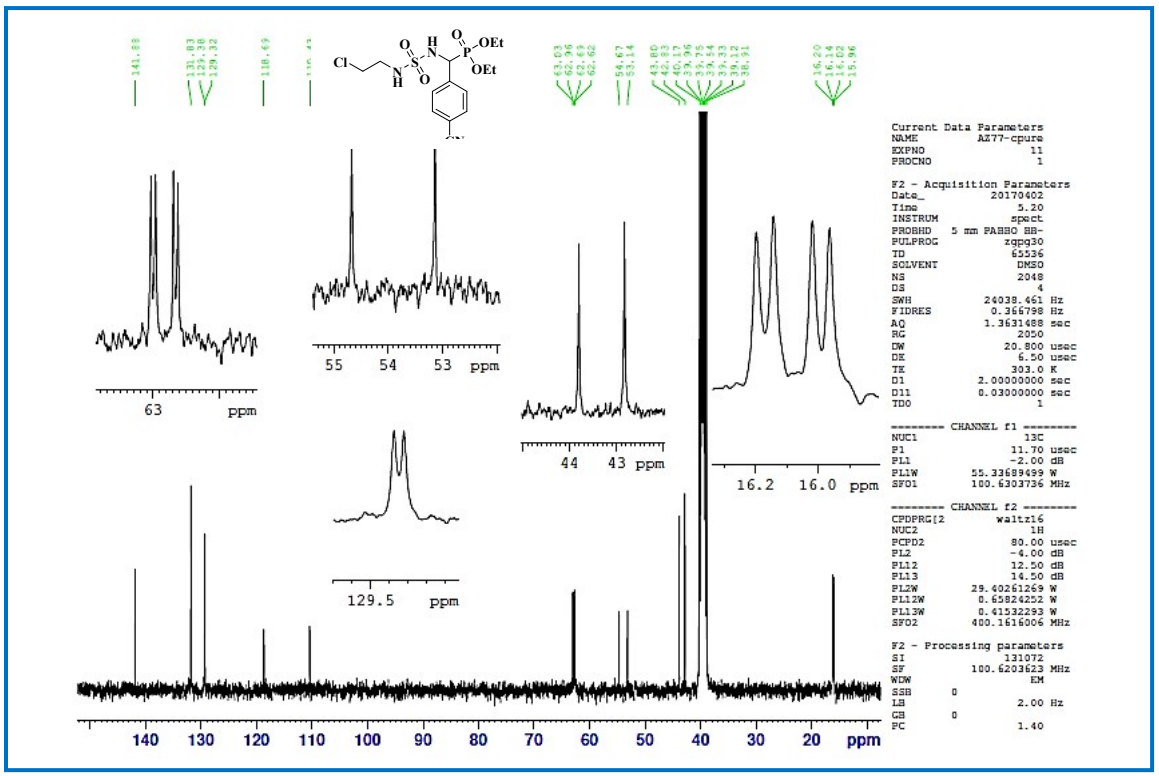
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(trifluoromethyl)phenyl)methyl)phosphonate* **(16h)**



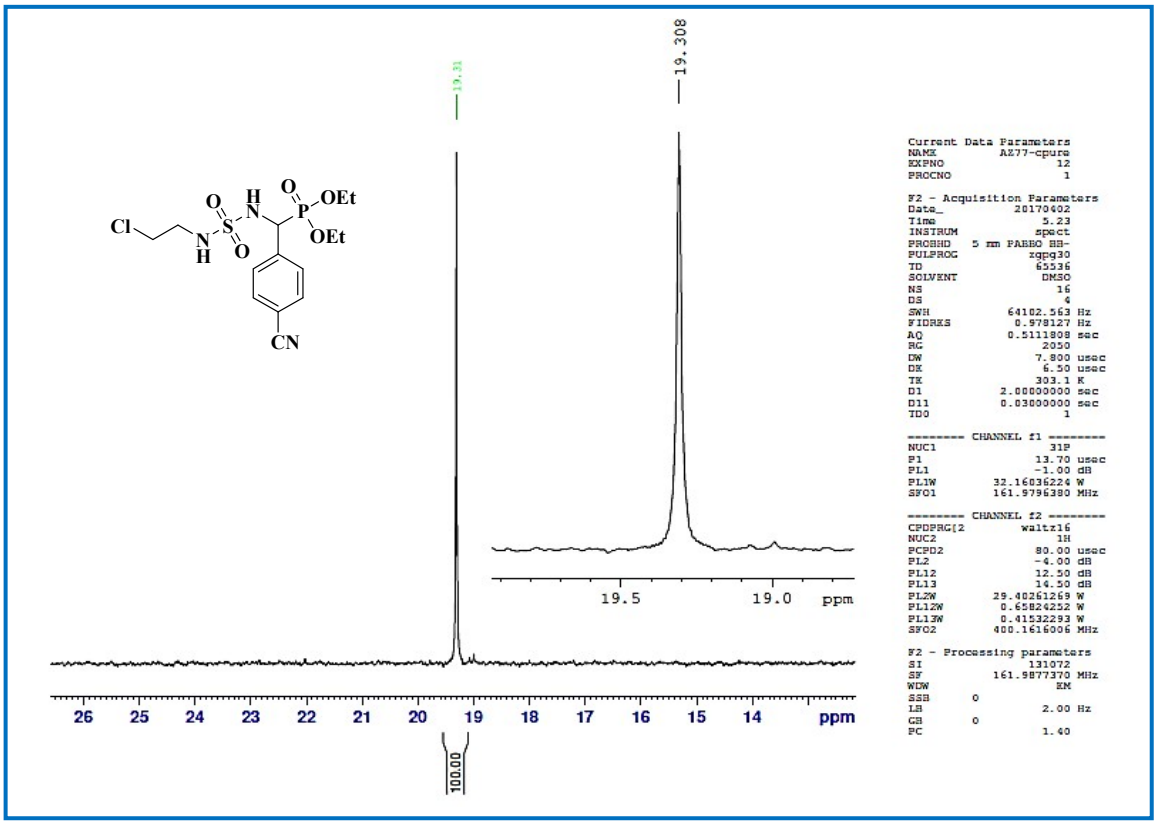
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-(trifluoromethyl)phenyl)methyl)phosphonate* **(16h)**



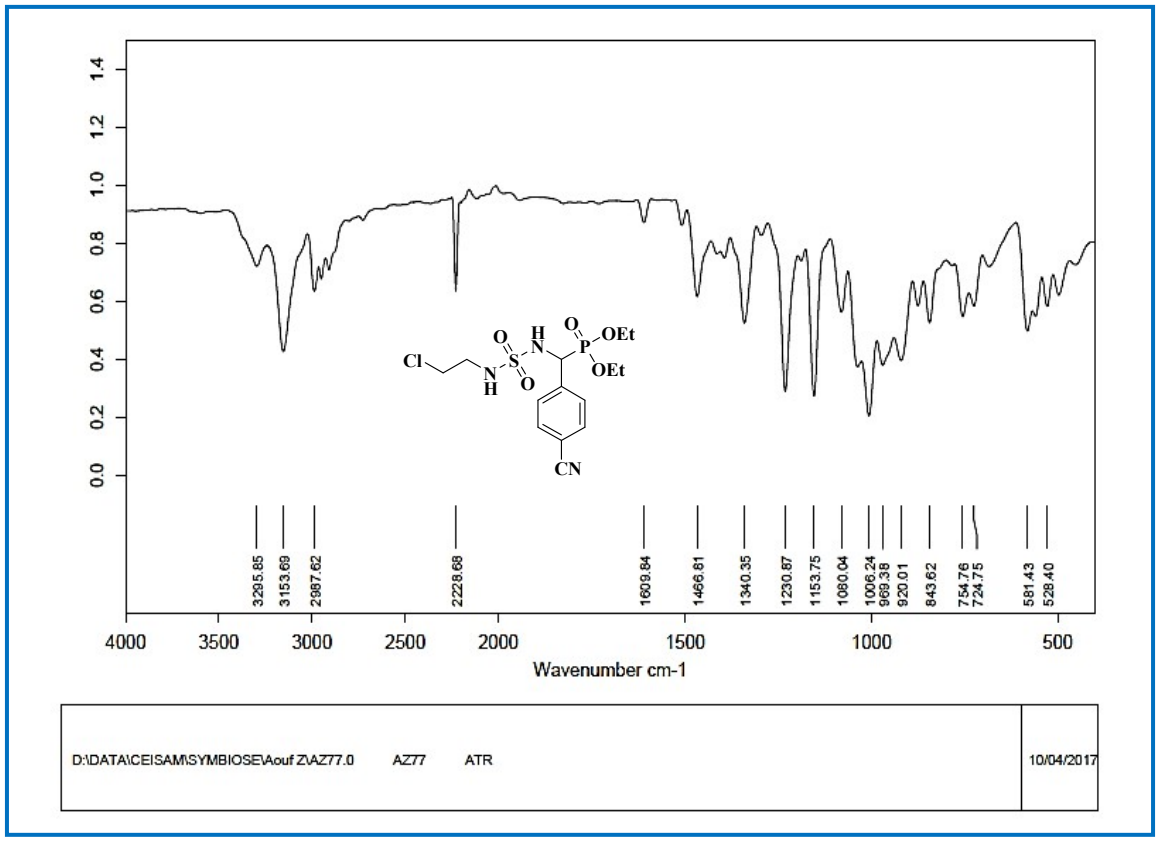
[1]H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-cyanophenyl)methyl)phosphonate* **(16i)**



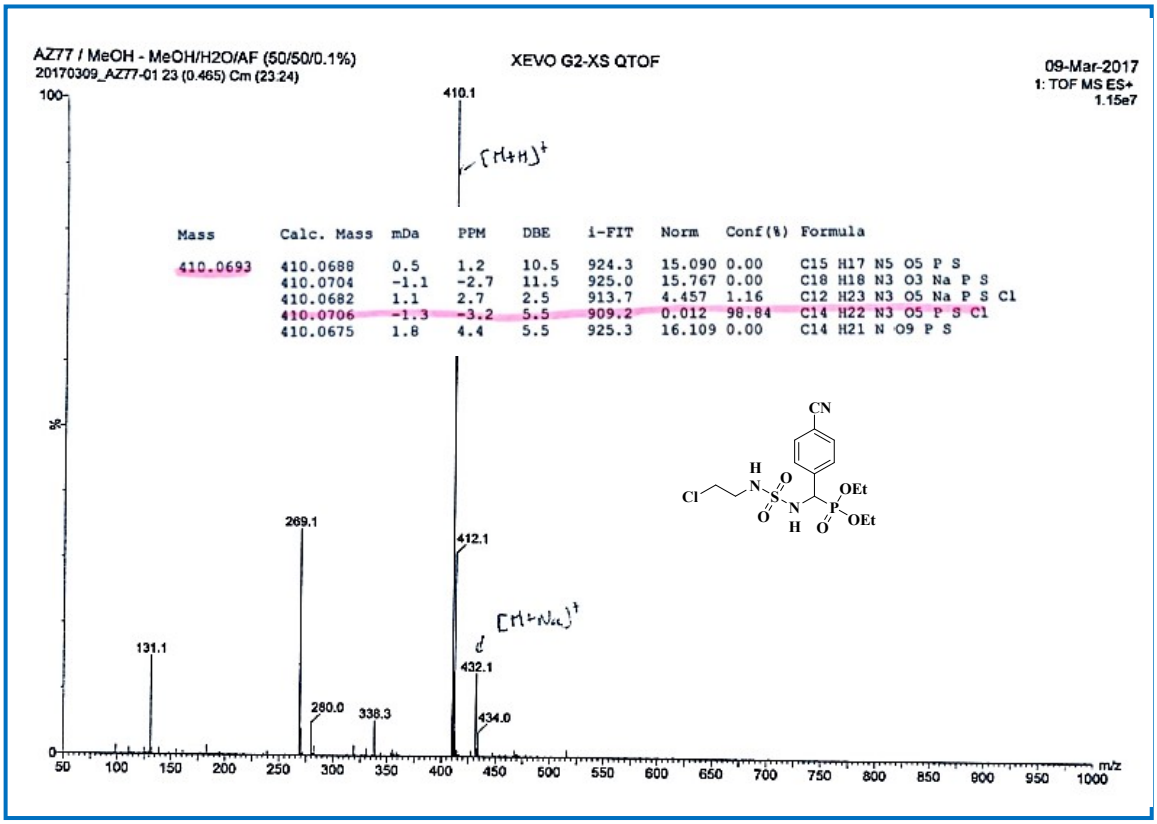
[13]C NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-cyanophenyl)methyl)phosphonate* **(16i)**



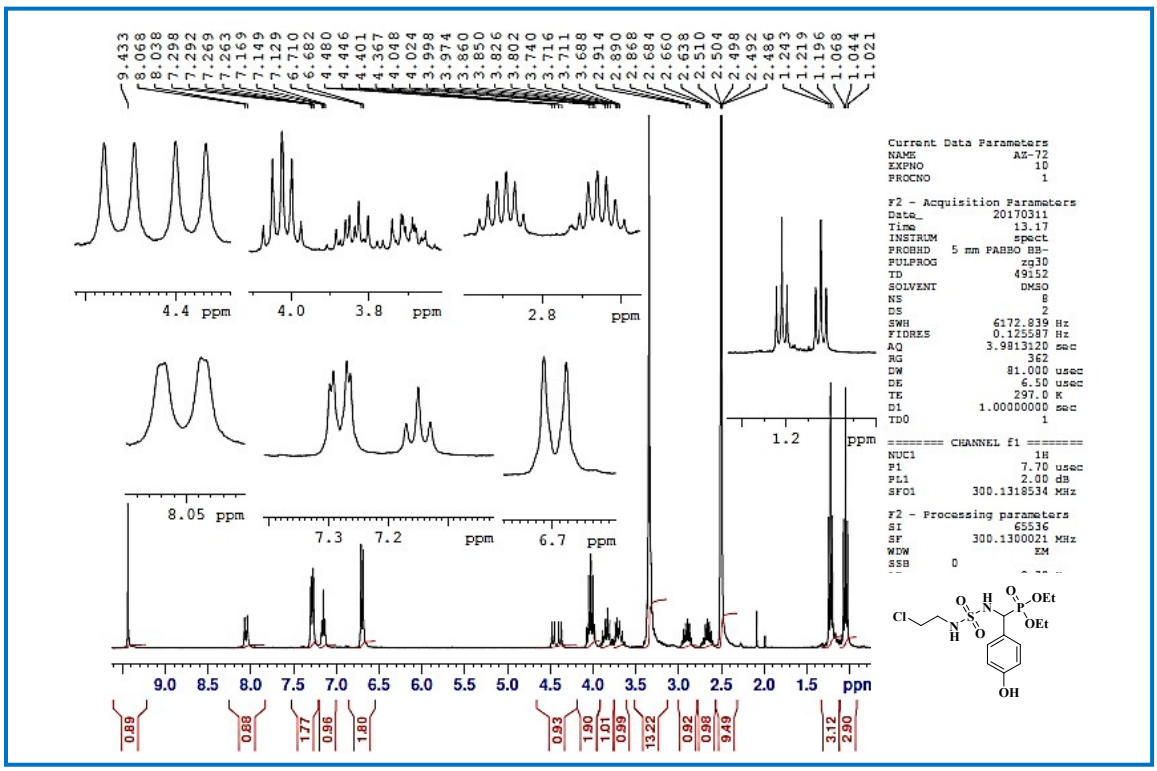
^{31}P NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-cyanophenyl)methyl)phosphonate* **(16i)**



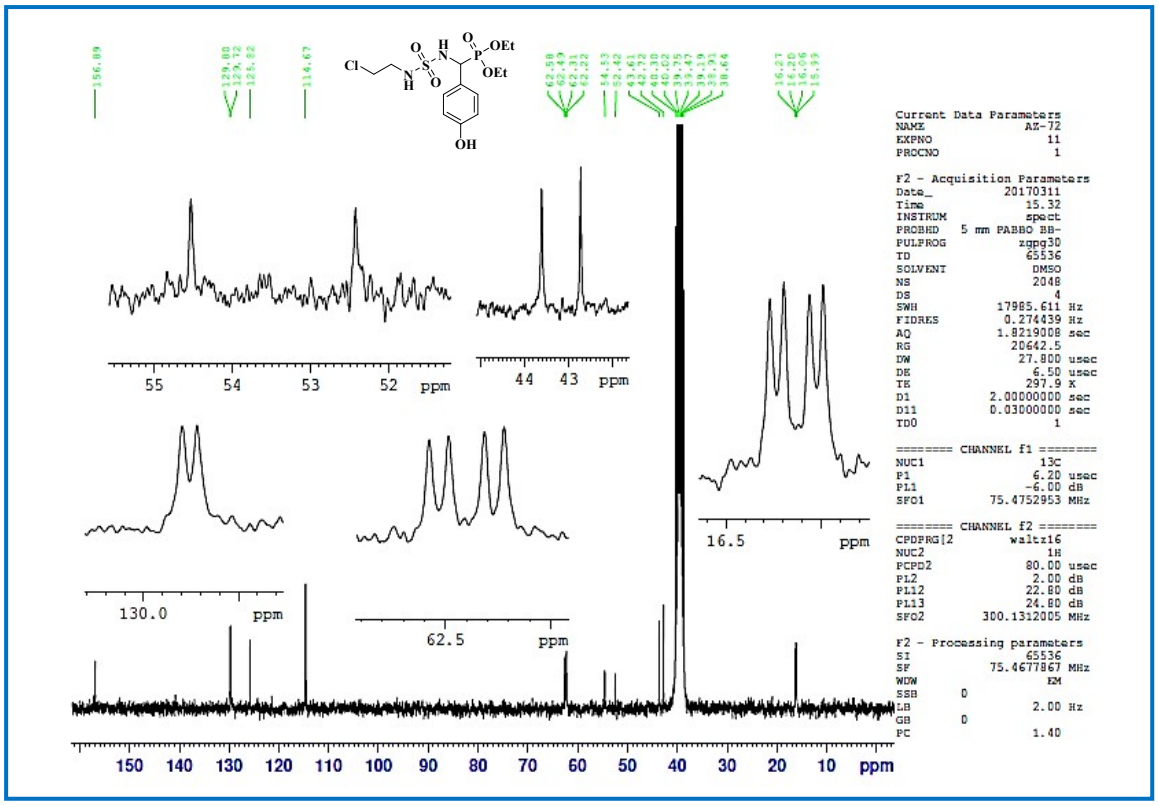
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-cyanophenyl)methyl)phosphonate* **(16i)**



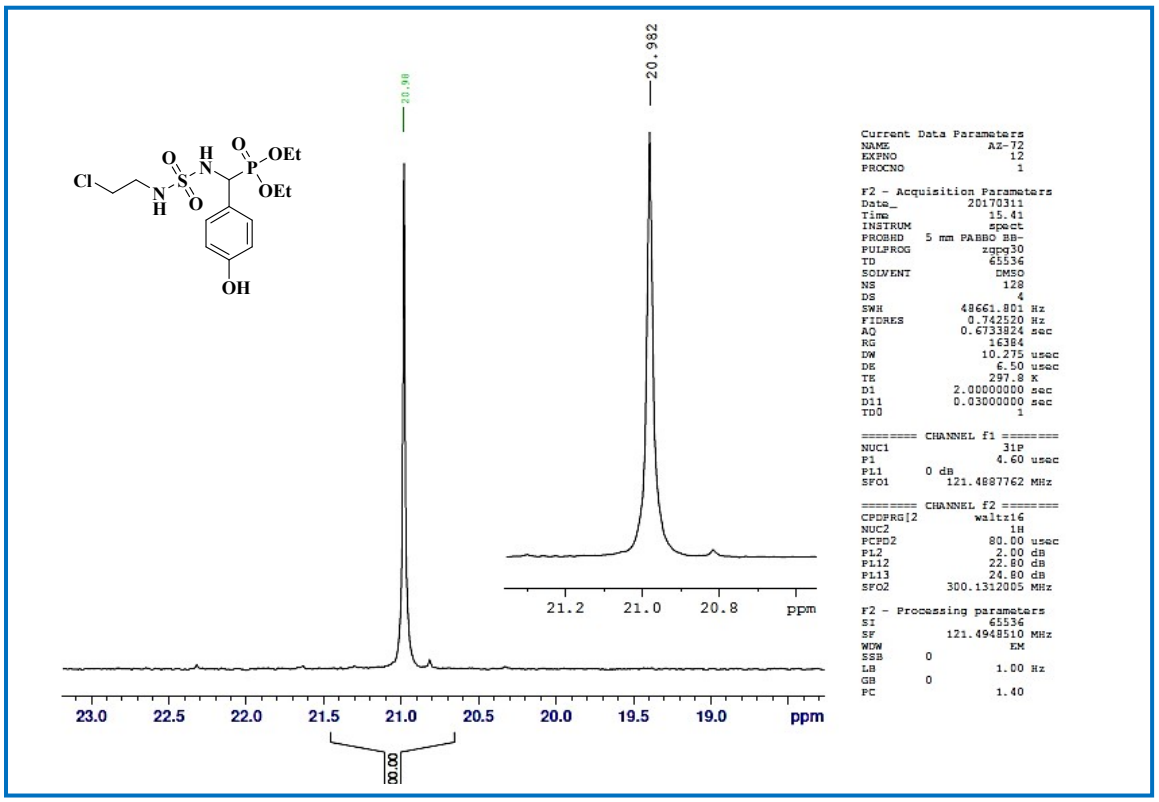
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-cyanophenyl)methyl)phosphonate* **(16i)**



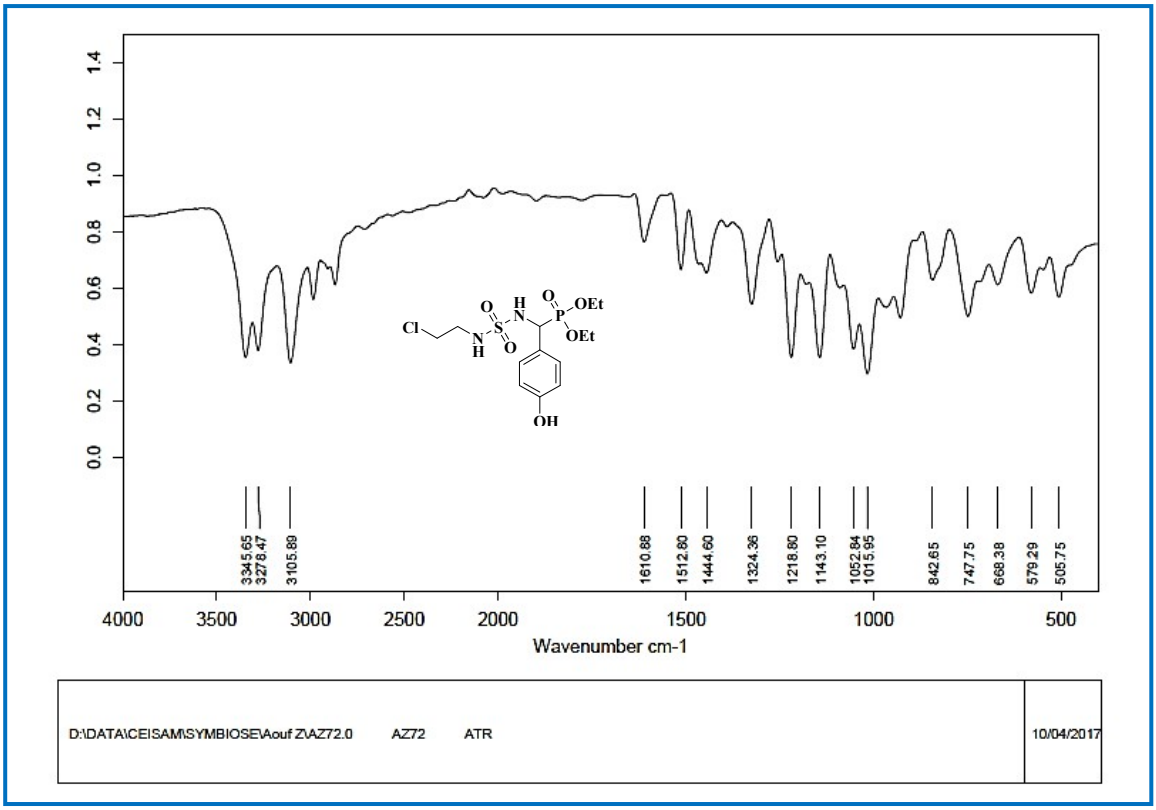
*[1]**H NMR Spectrum:*** *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-hydroxyphenyl)methyl)phosphonate* **(16j)**



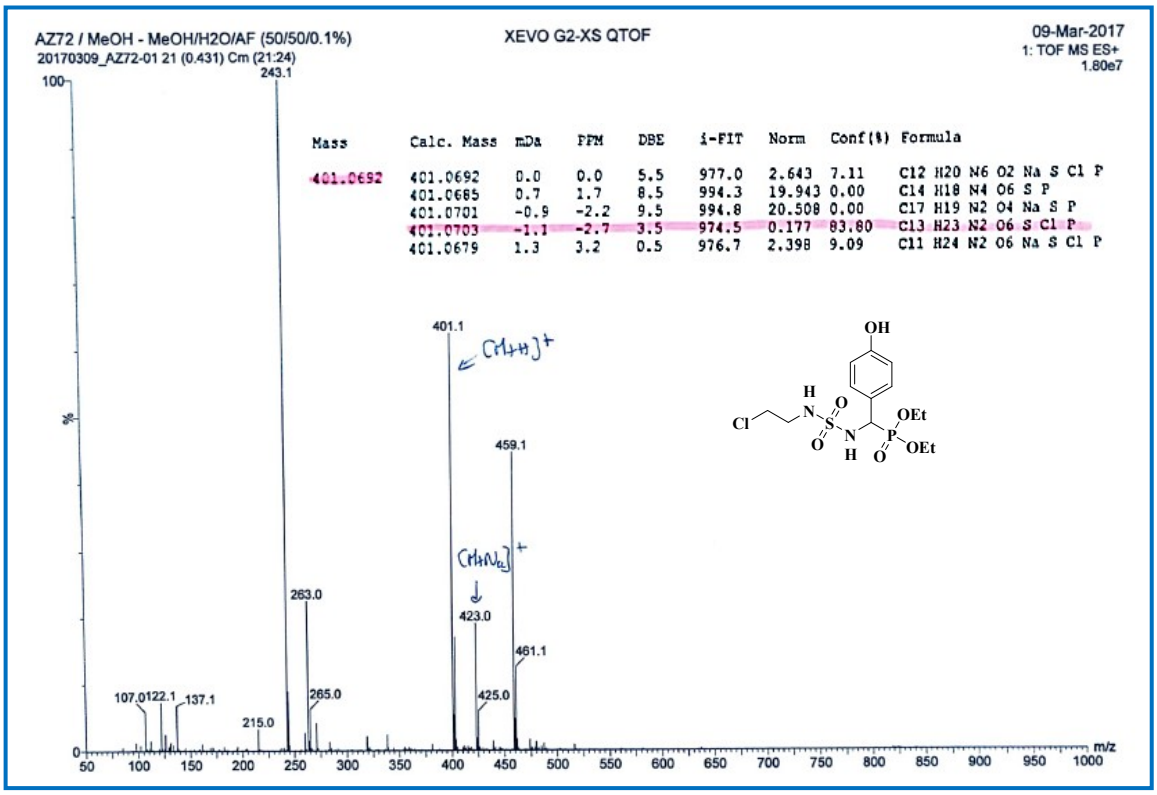
*[13]**C NMR Spectrum:** Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-hydroxyphenyl)methyl)phosphonate* **(16j)**



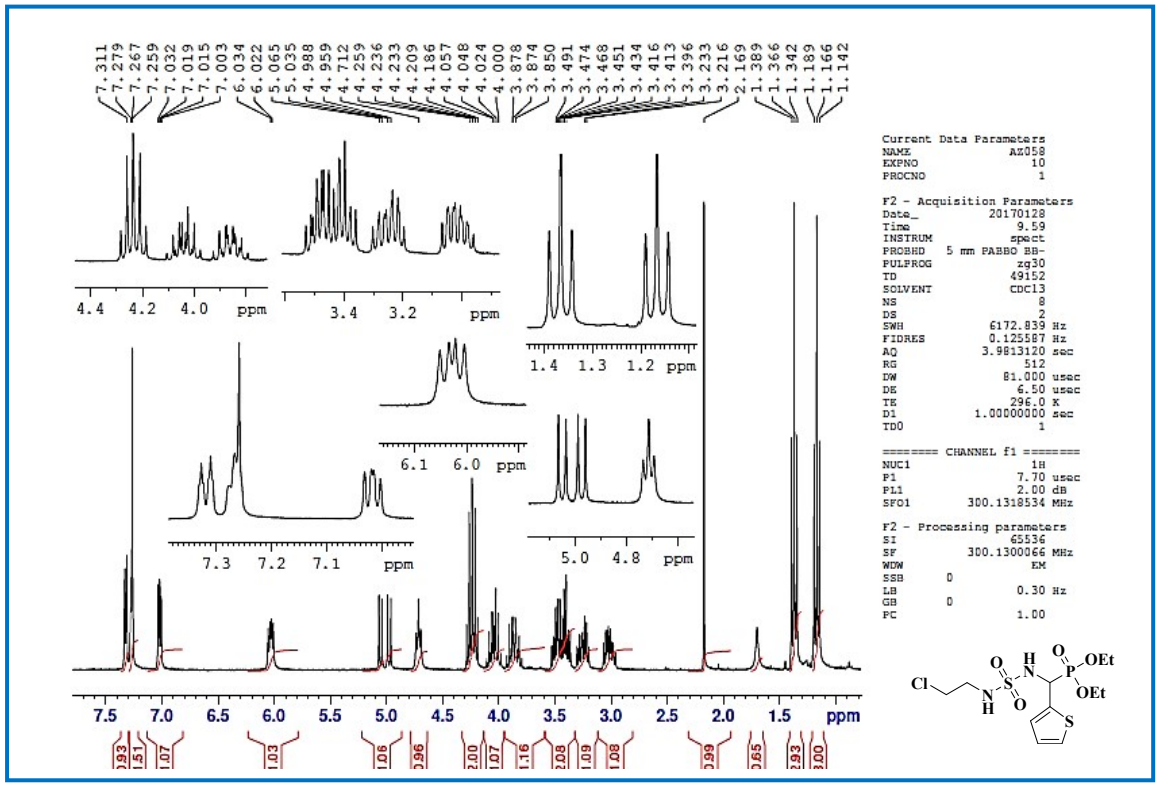
*[31]**P NMR Spectrum:** Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-hydroxyphenyl)methyl)phosphonate* **(16j)**



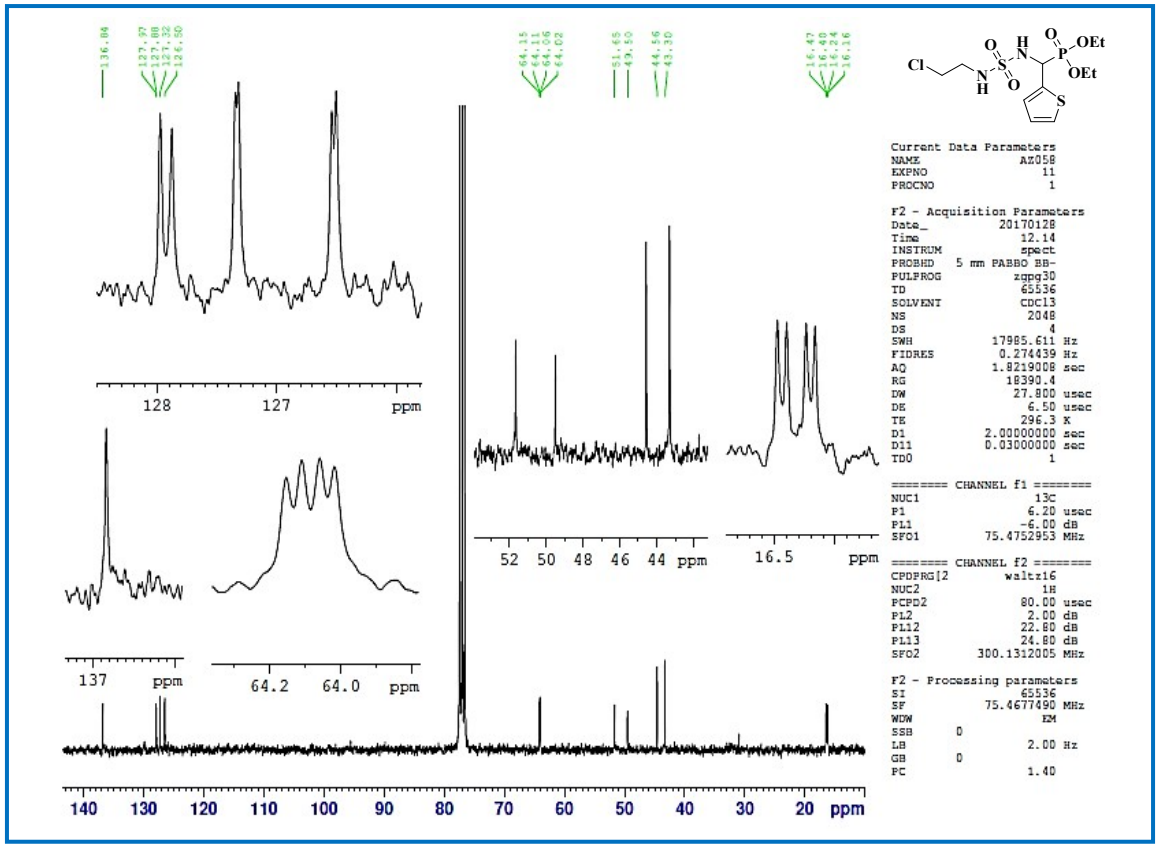
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-hydroxyphenyl)methyl)phosphonate* **(16j)**



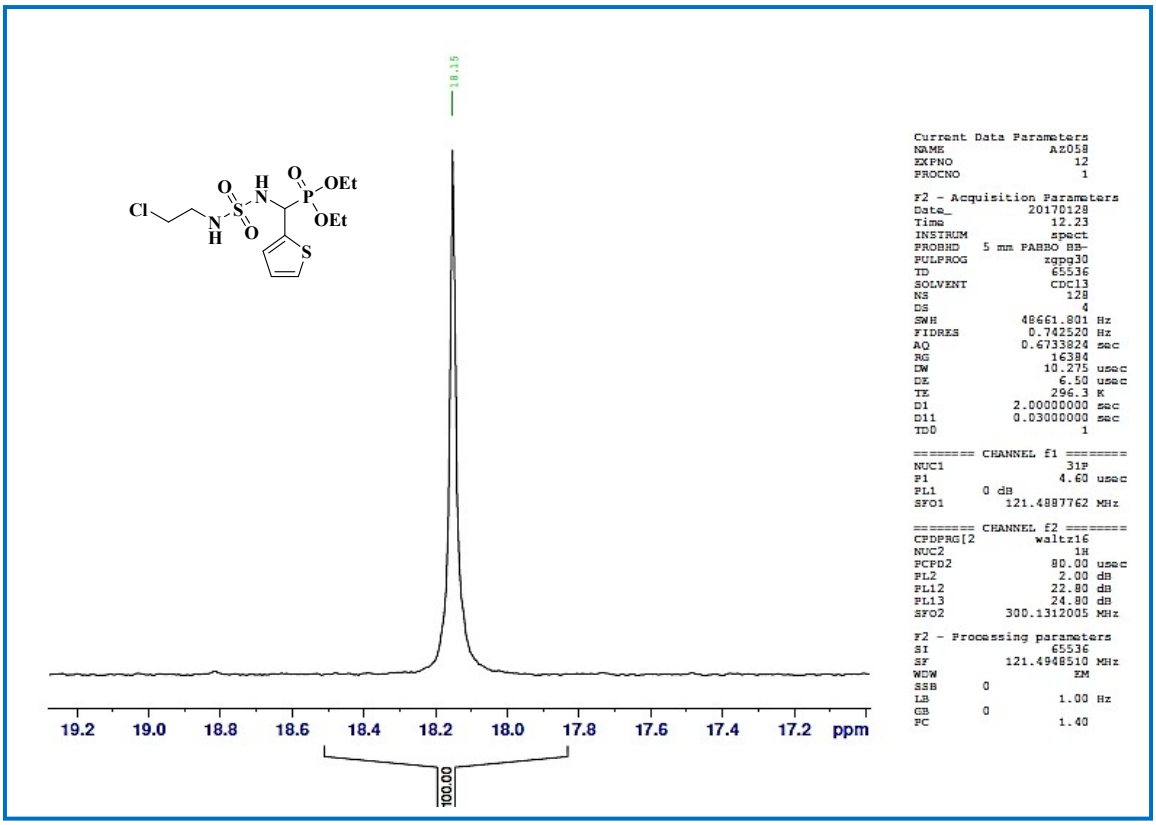
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(4-hydroxyphenyl)methyl)phosphonate* **(16j)**



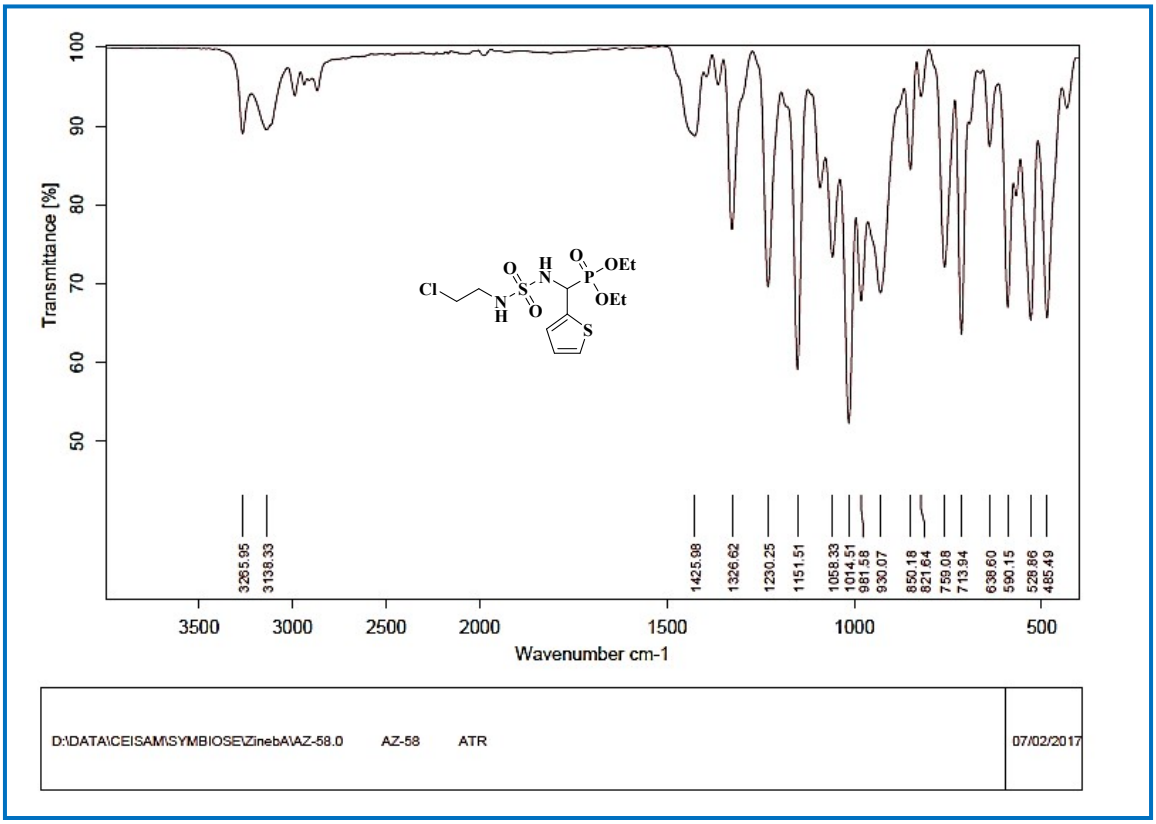
[1]H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(thiophen-2-yl)methyl)phosphonate* **(16k)**



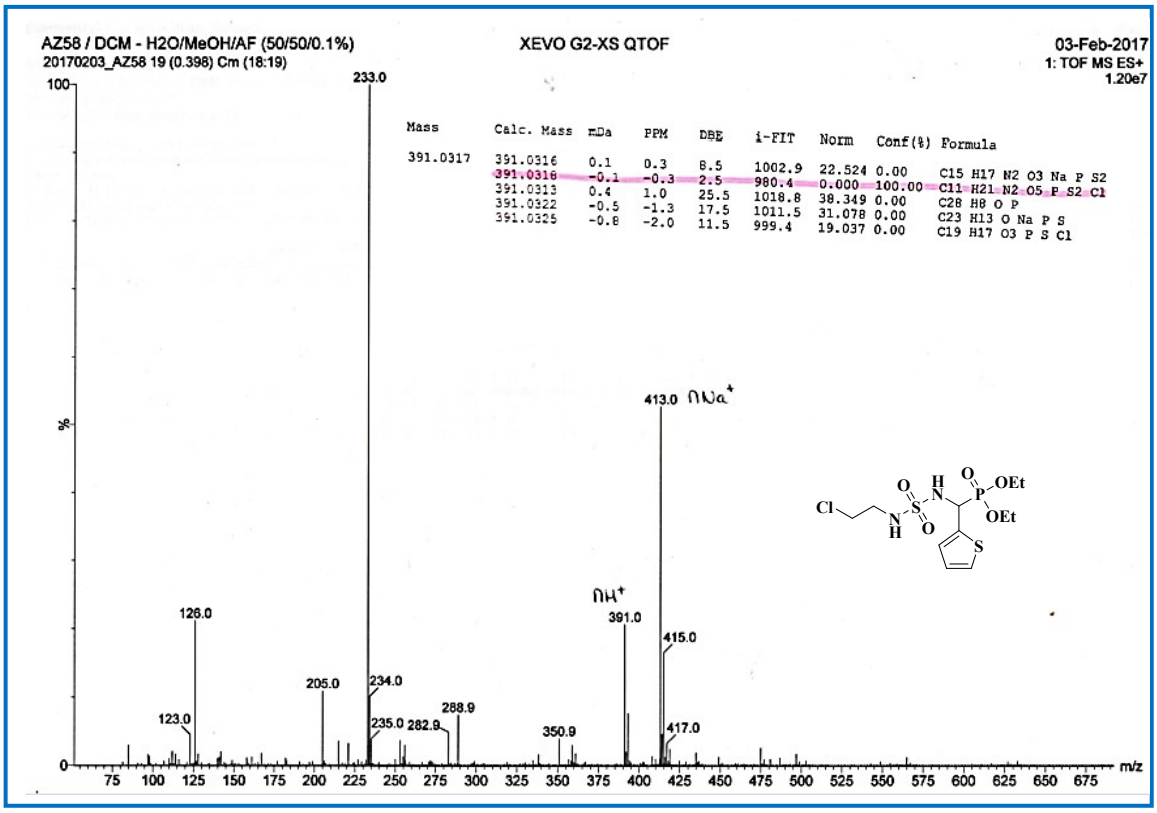
[13]C NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(thiophen-2-yl)methyl)phosphonate* **(16k)**



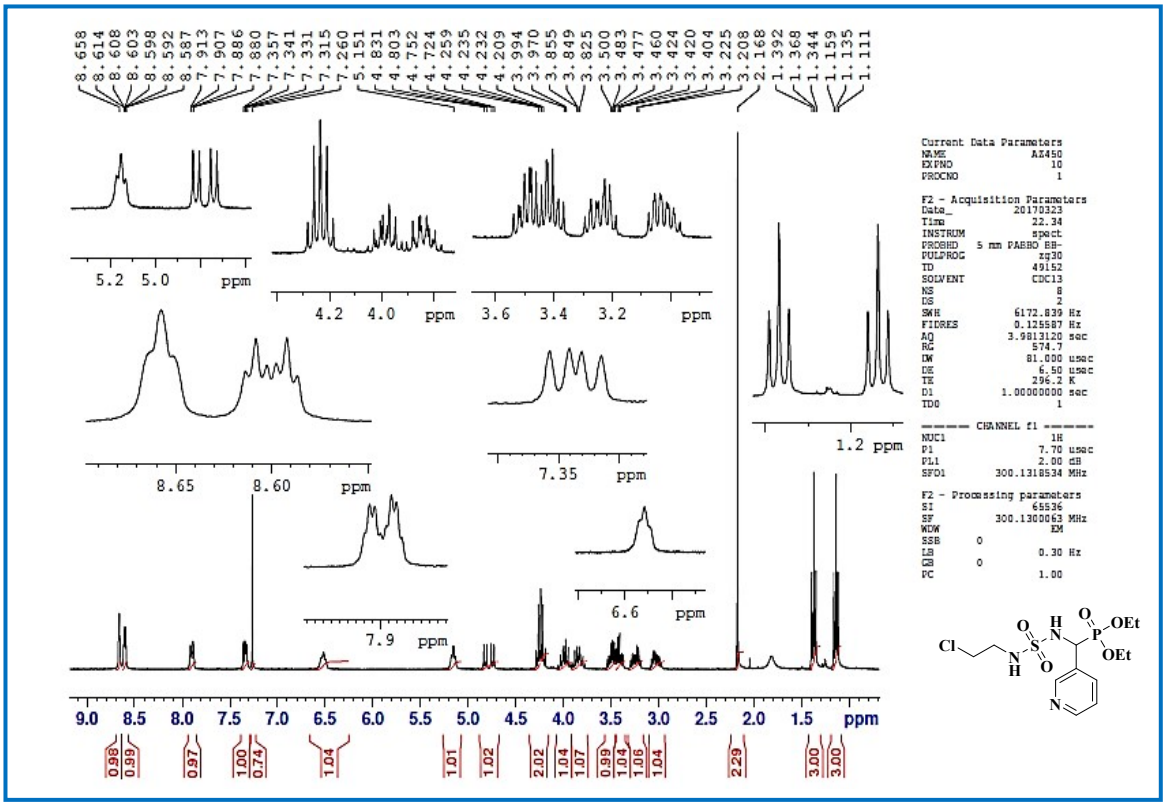
^{31}P NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(thiophen-2-yl)methyl)phosphonate* **(16k)**



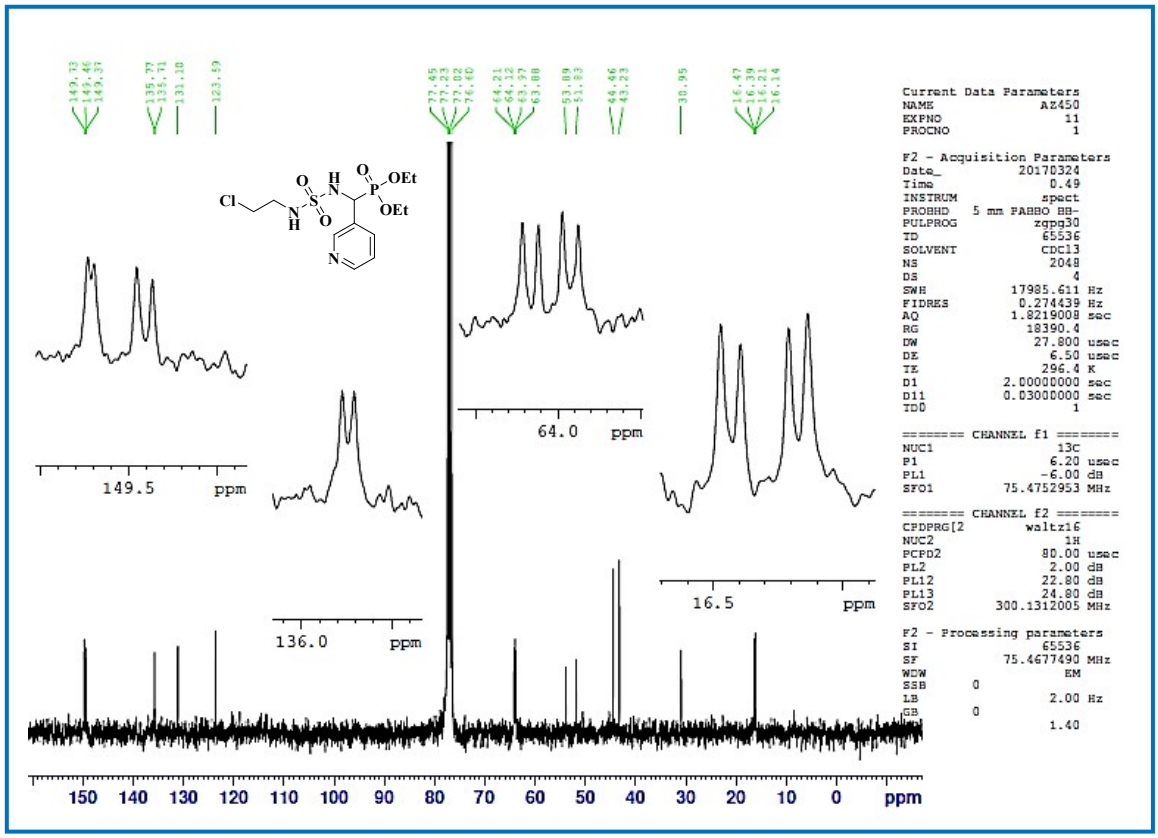
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(thiophen-2-yl)methyl)phosphonate* **(16k)**



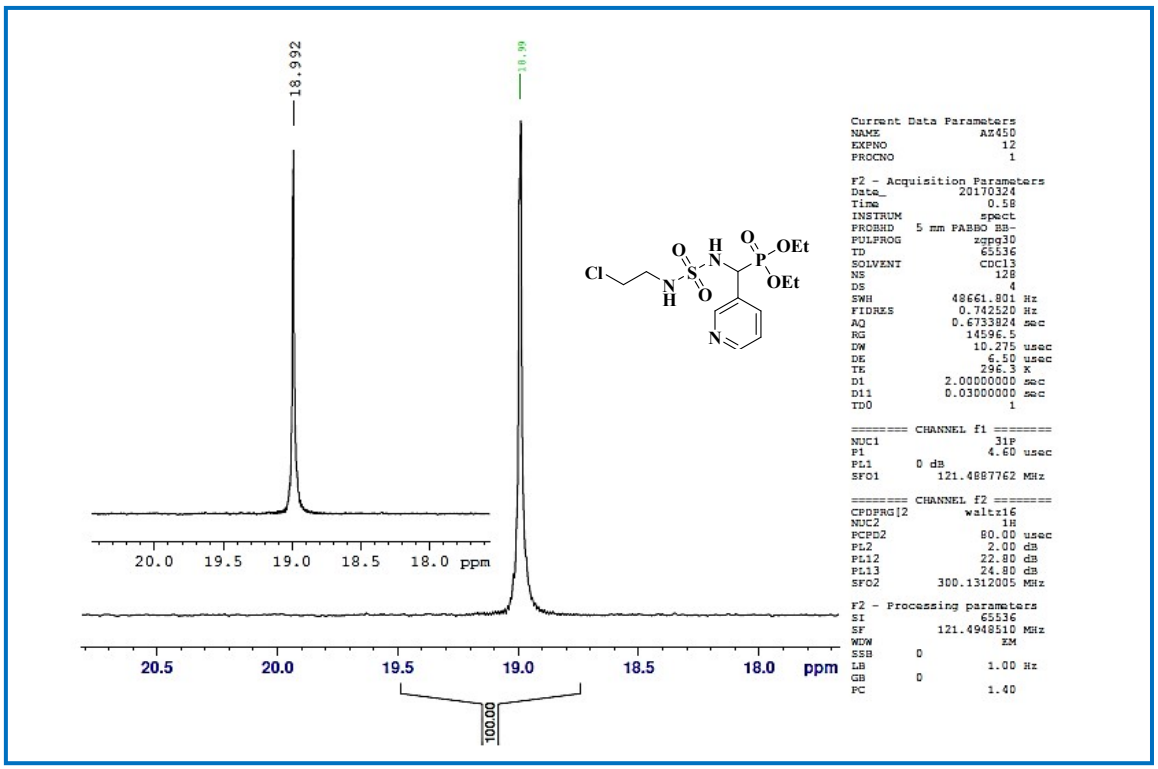
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(thiophen-2-yl)methyl)phosphonate* **(16k)**



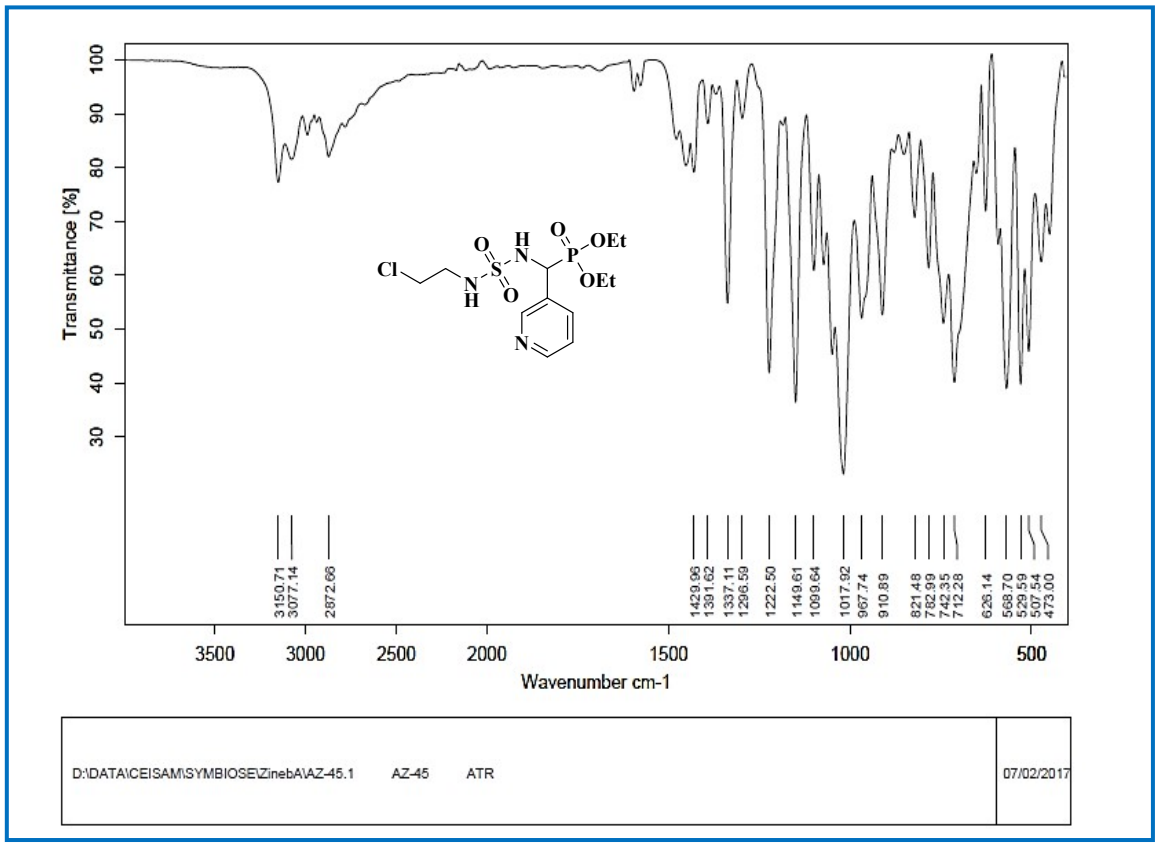
[1]H NMR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(pyridin-3-yl)methyl)phosphonate* **(16l)**



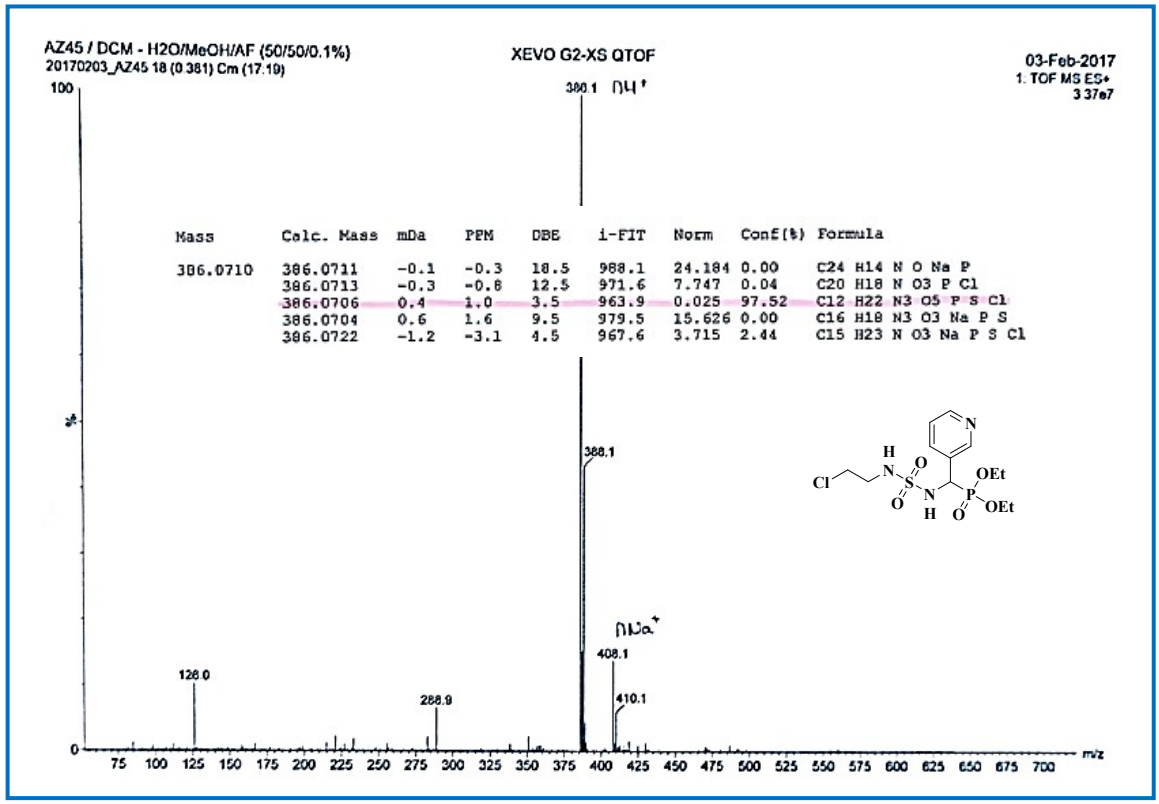
*[13]**C NMR Spectrum:** Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(pyridin-3-yl)methyl)phosphonate* **(16l)**



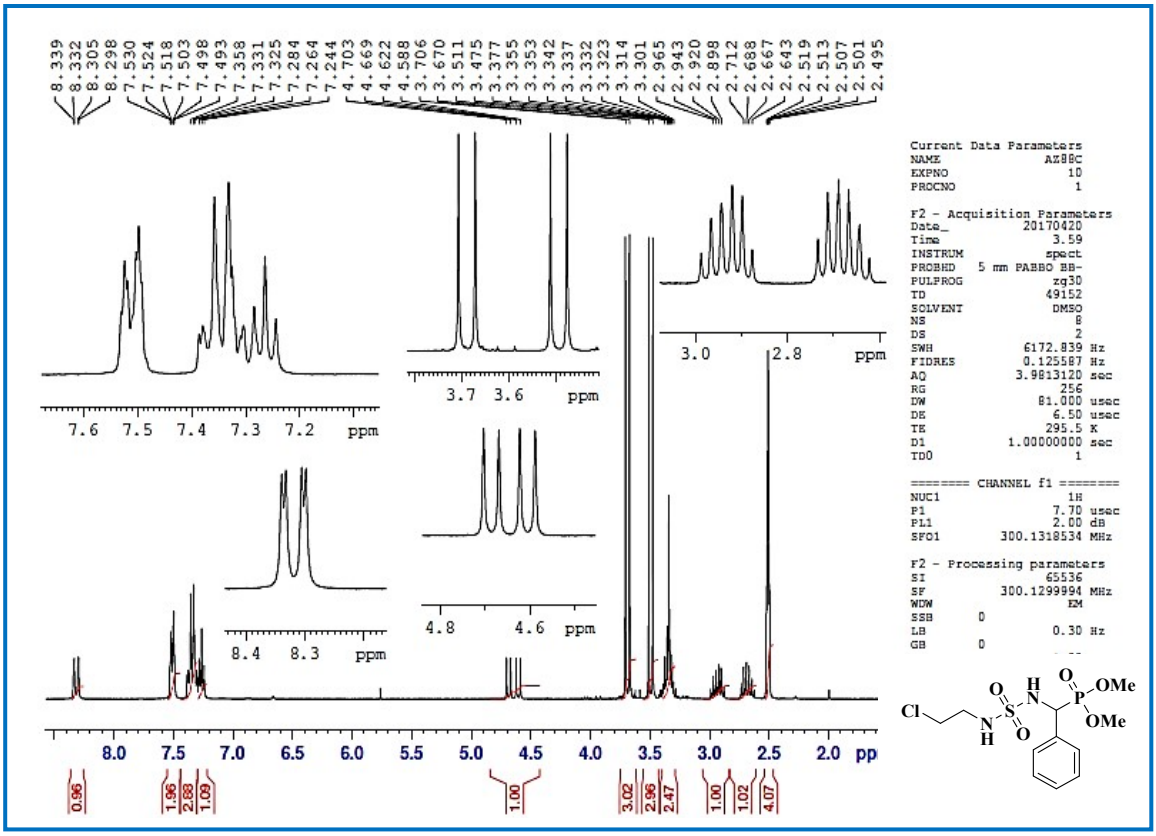
*[31]**P NMR Spectrum:** Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(pyridin-3-yl)methyl)phosphonate* **(16l)**



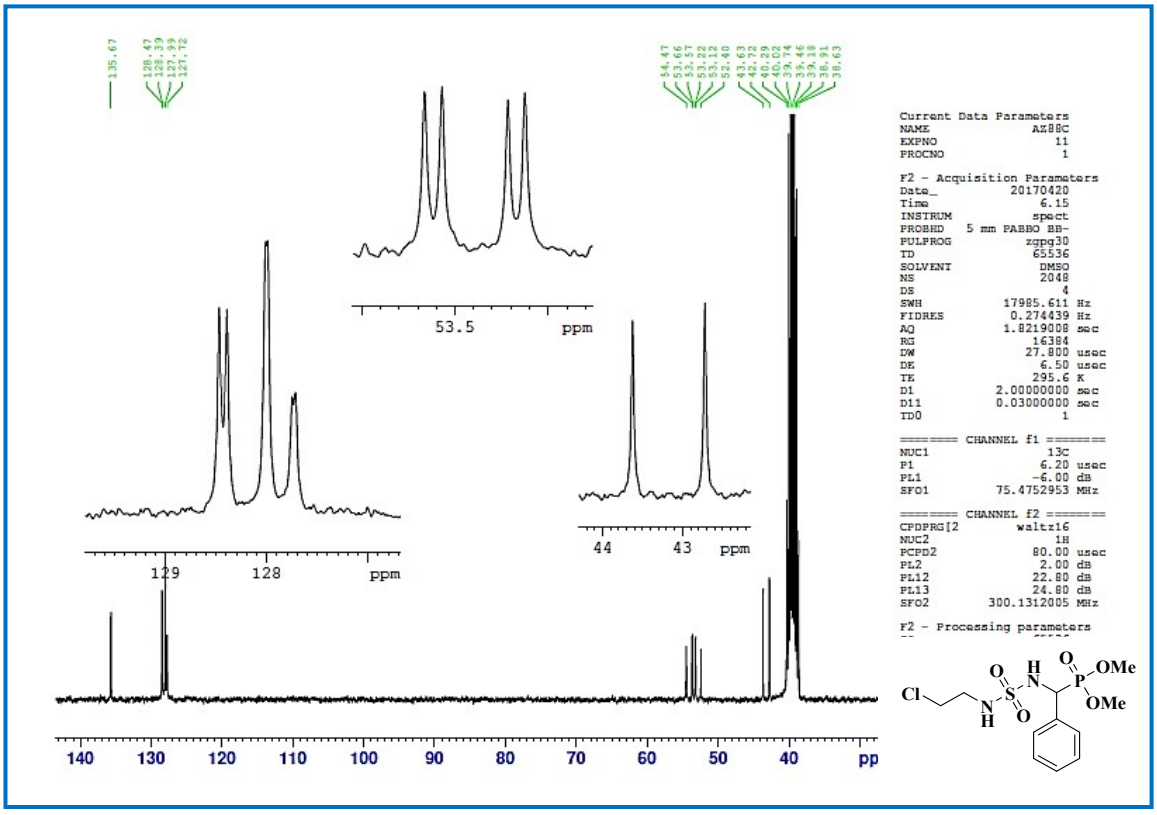
IR Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(pyridin-3-yl)methyl)phosphonate* **(16l)**



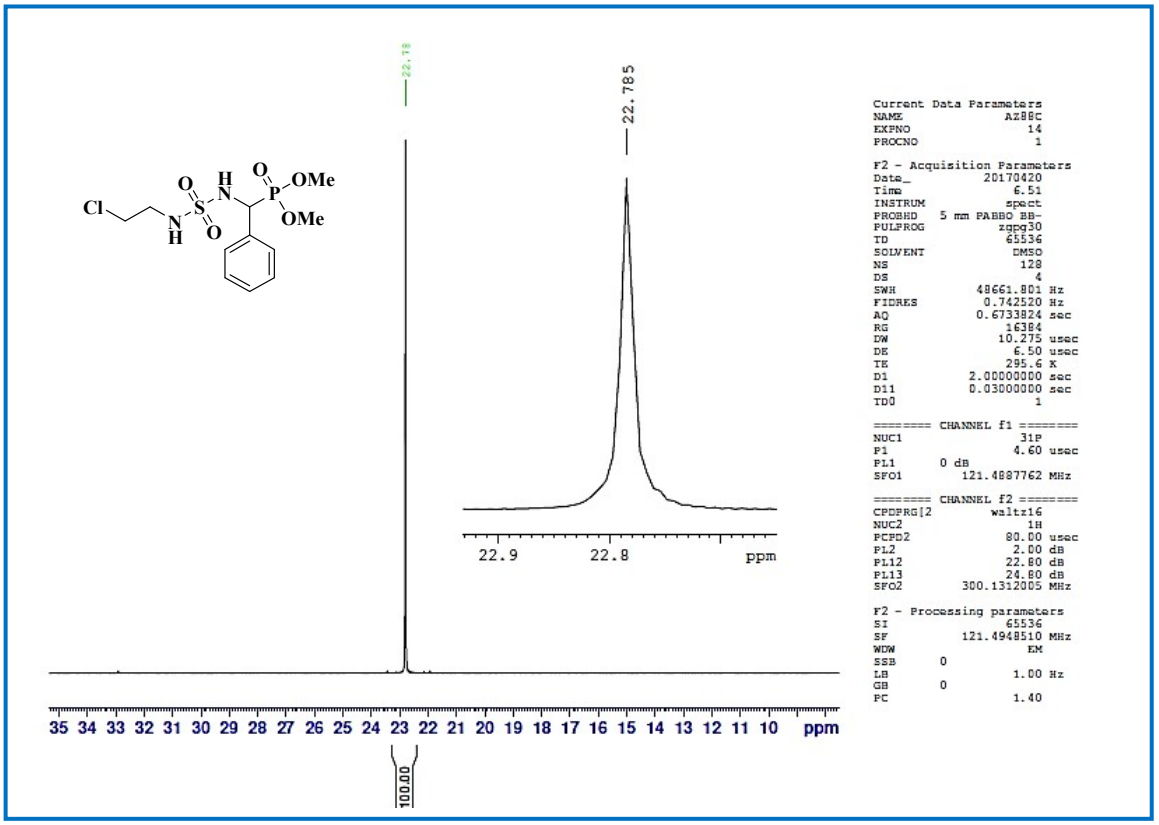
MS Spectrum: *Diethyl (((N-(2-chloroethyl)sulfamoyl)amino)(pyridin-3-yl)methyl)phosphonate* **(16l)**



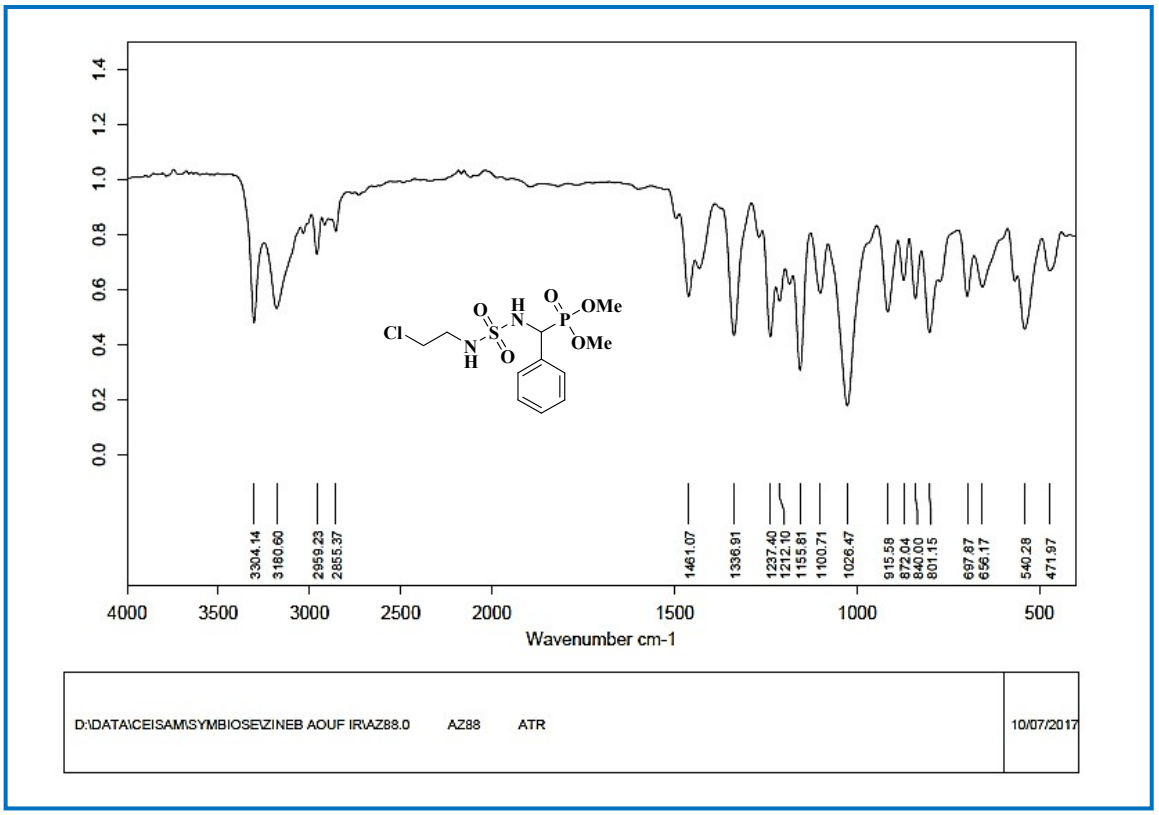
[1]H NMR Spectrum: *Dimethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16m)**



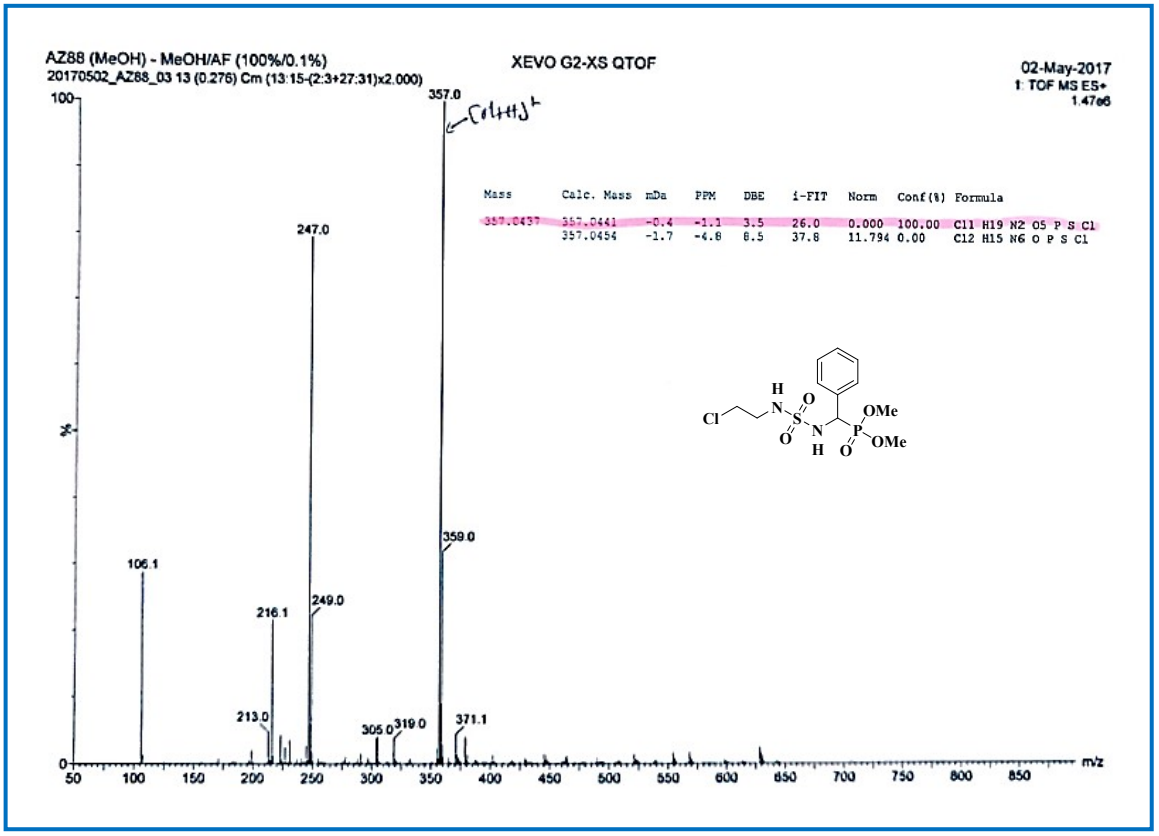
[13]C NMR Spectrum: *Dimethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16m)**



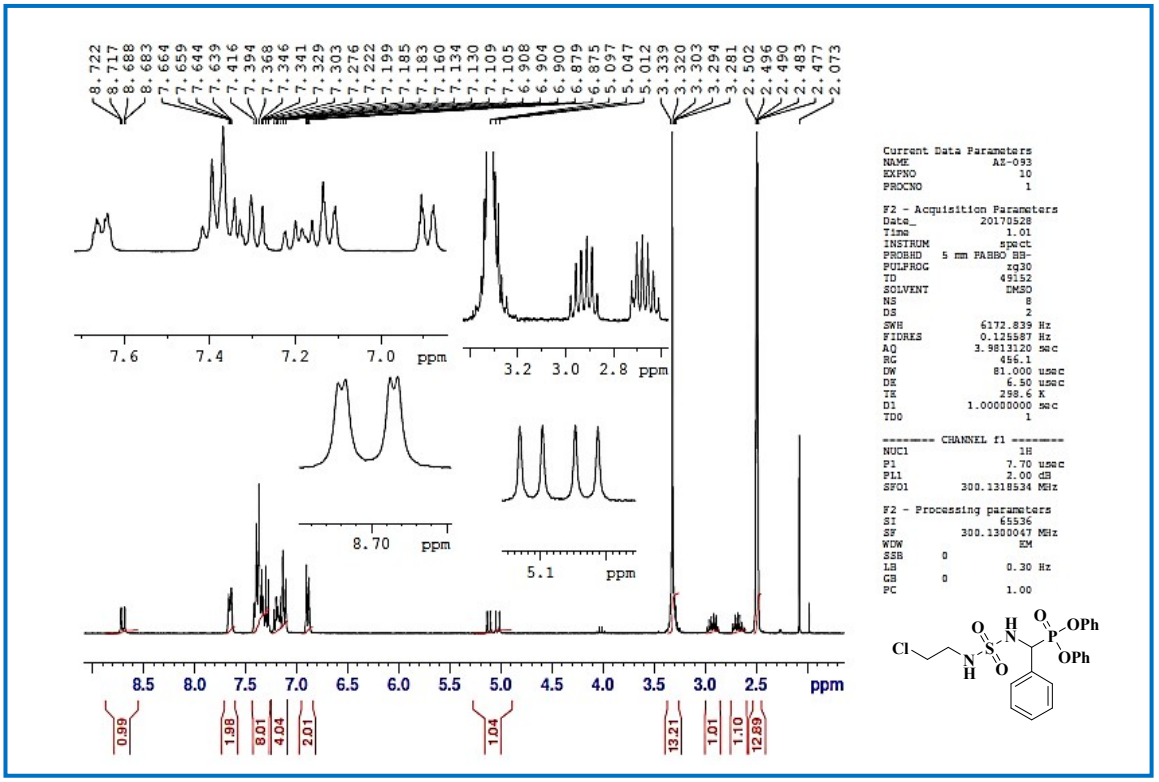
^{31}P NMR Spectrum: *Dimethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16m)**



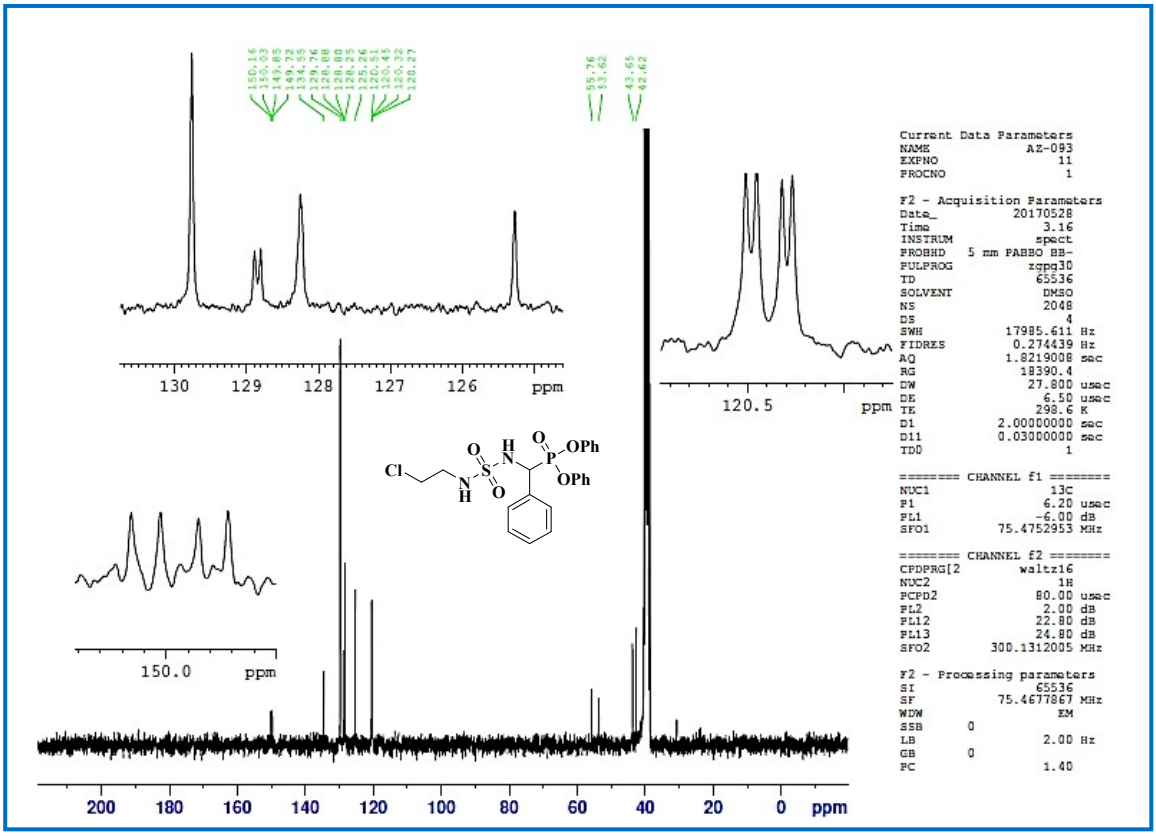
IR Spectrum: *Dimethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16m)**



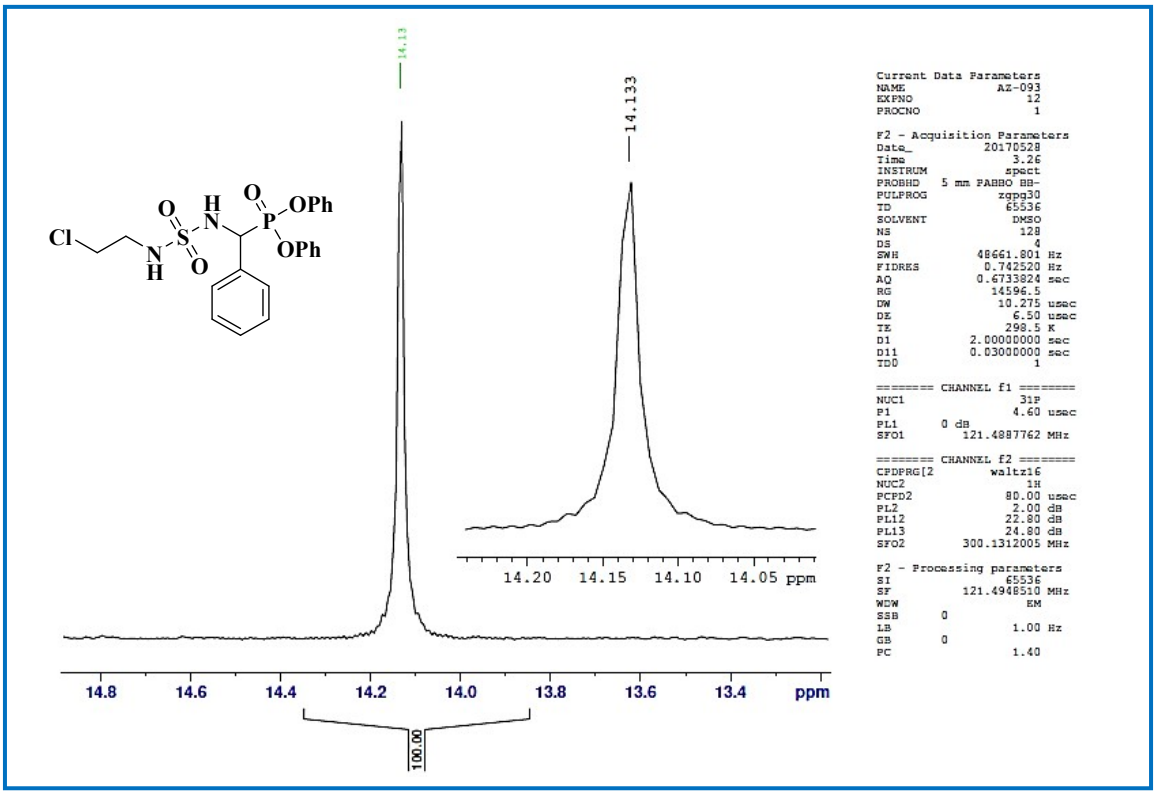
MS Spectrum: *Dimethyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16m)**



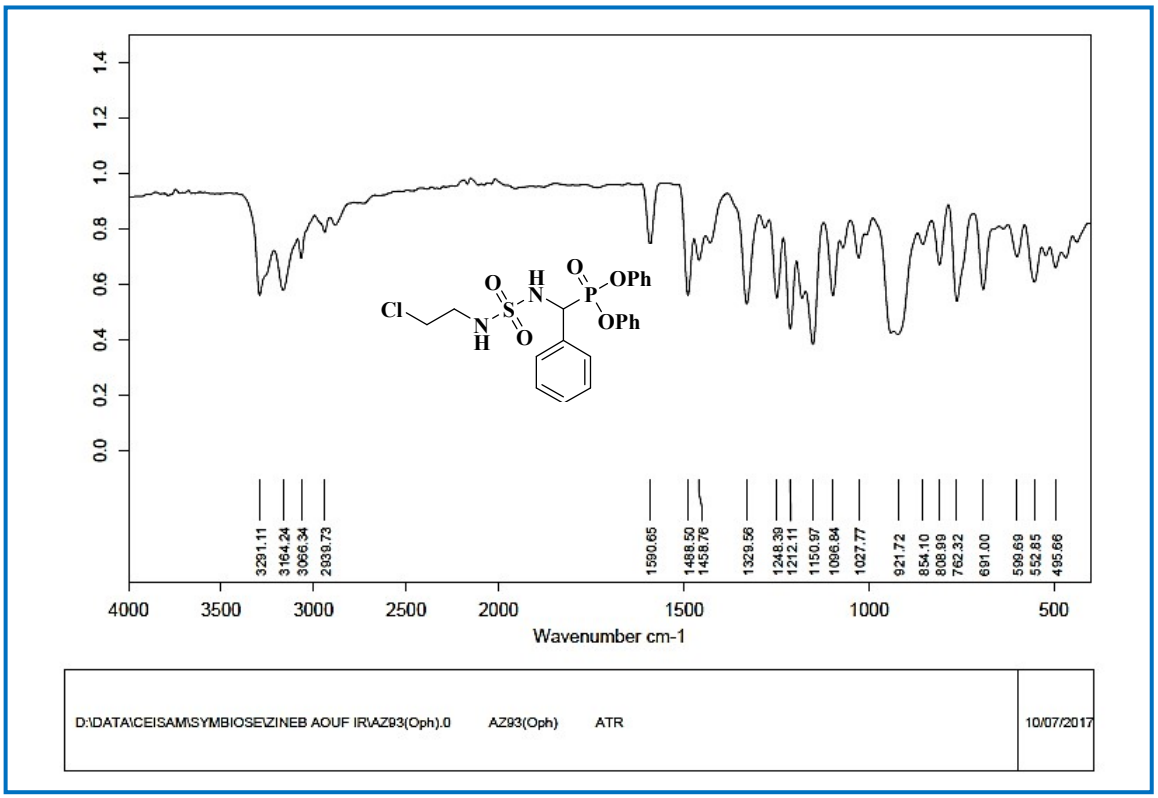
[1]***H NMR Spectrum:*** *Diphenyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16n)**



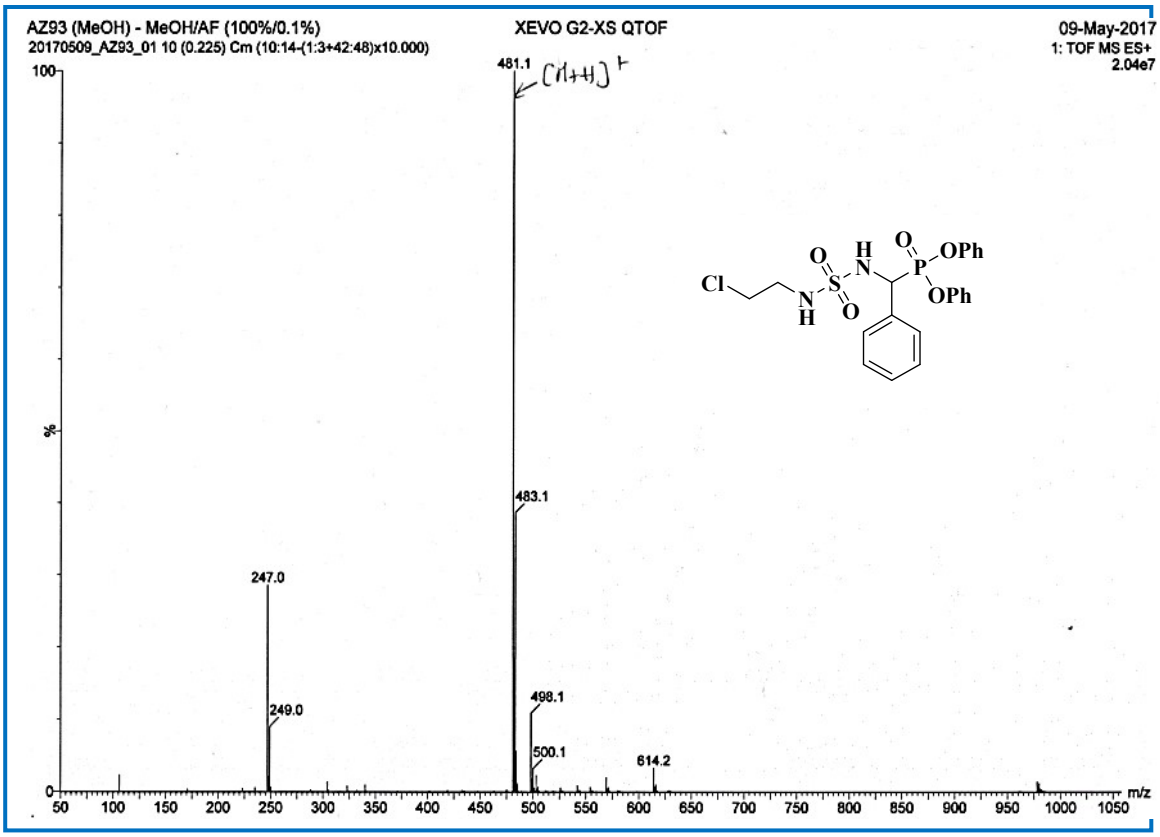
[13]C NMR Spectrum: *Diphenyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16n)**



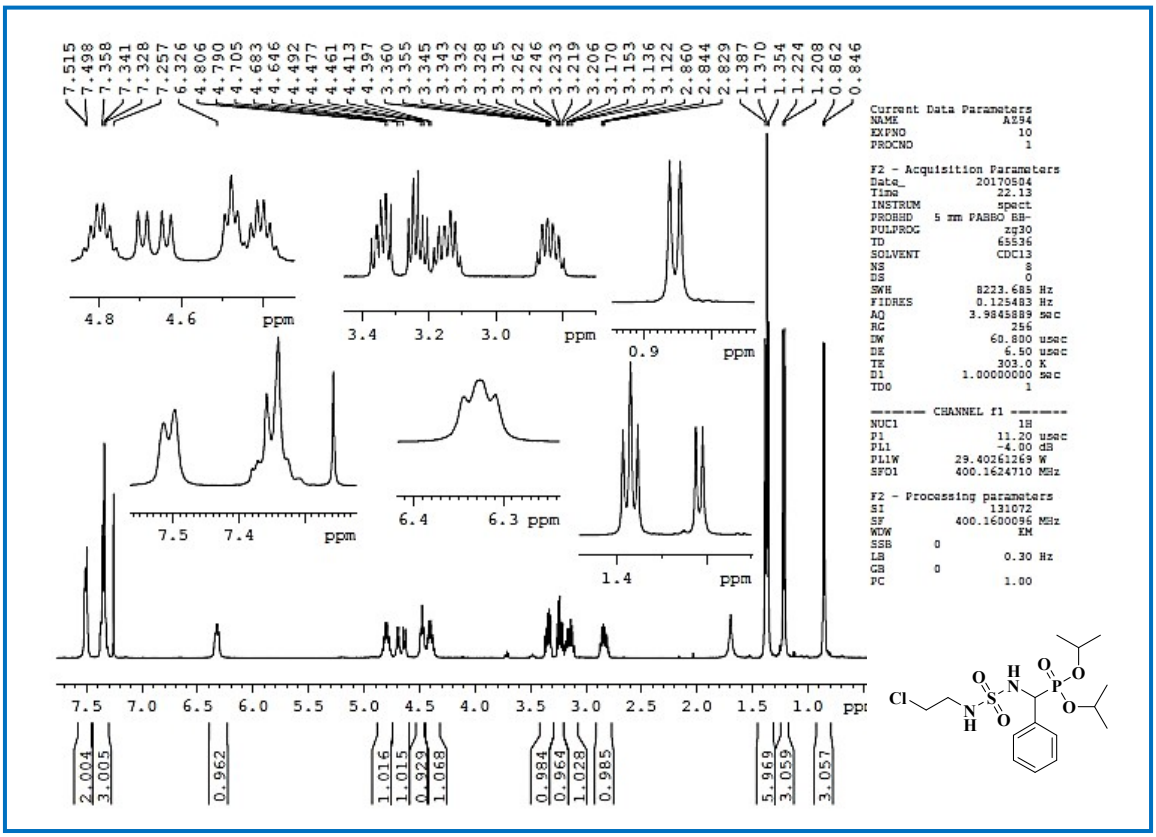
[31]P NMR Spectrum: *Diphenyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16n)**



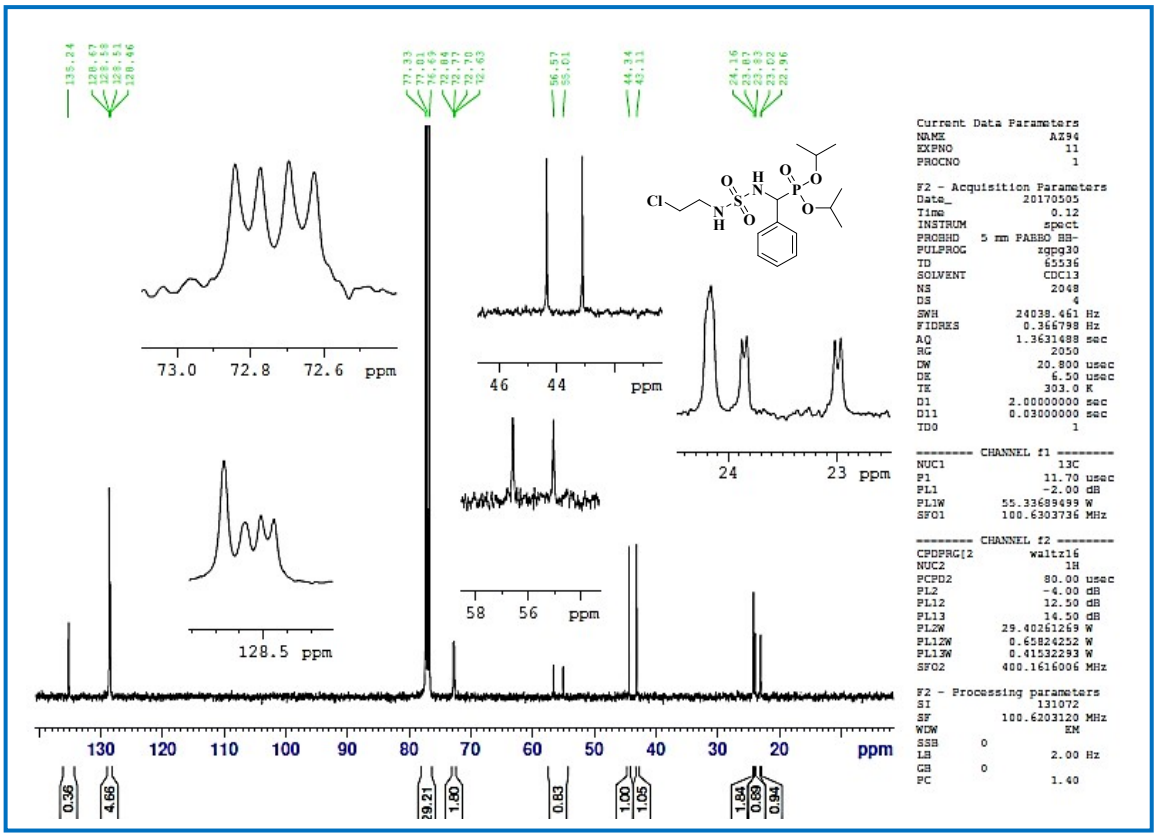
IR Spectrum: *Diphenyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16n)**



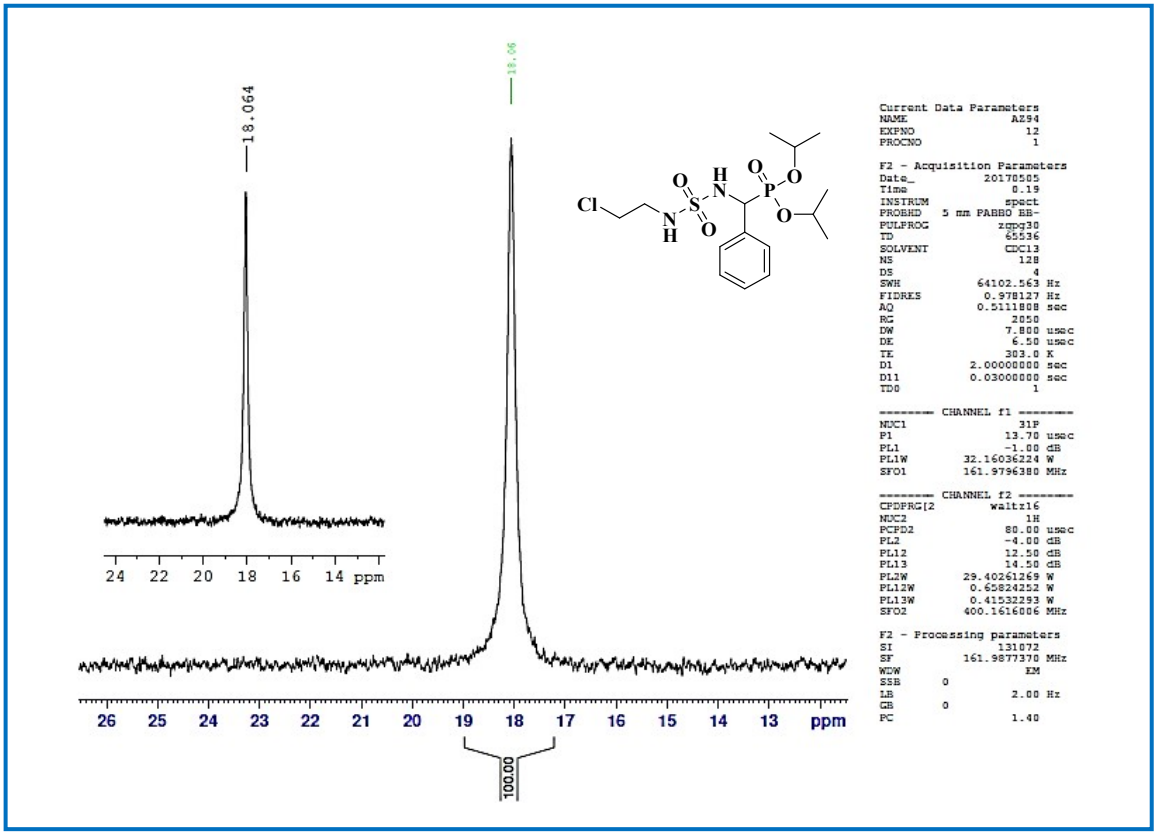
MS Spectrum: *Diphenyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16n)**



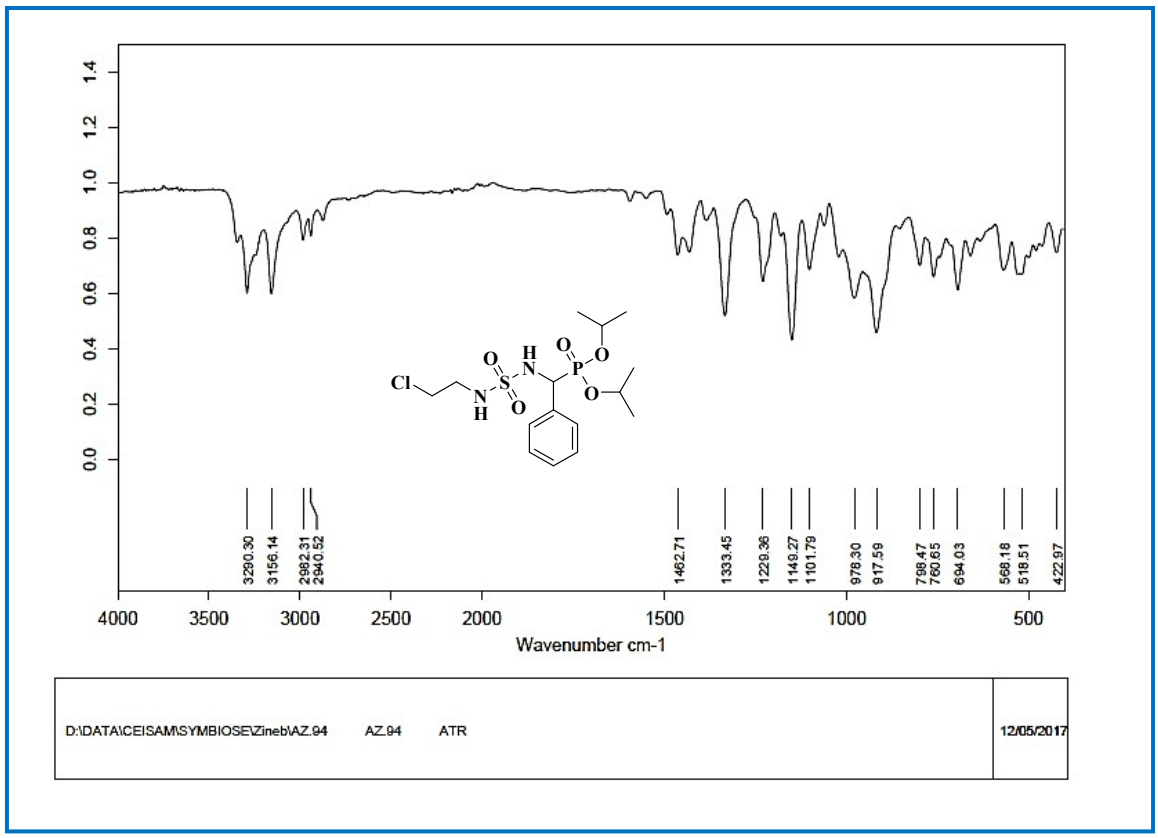
[1]H NMR Spectrum: *Diisopropyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16o)**



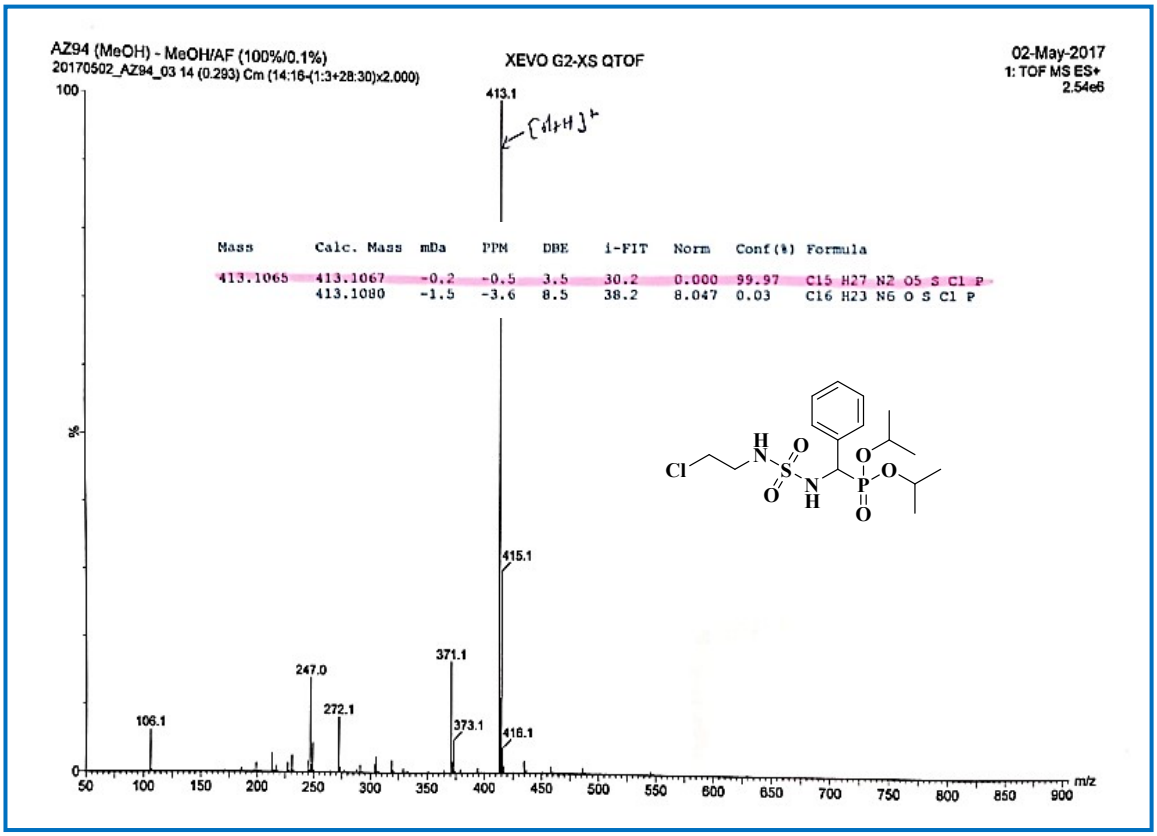
[13]C NMR Spectrum: *Diisopropyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16o)**



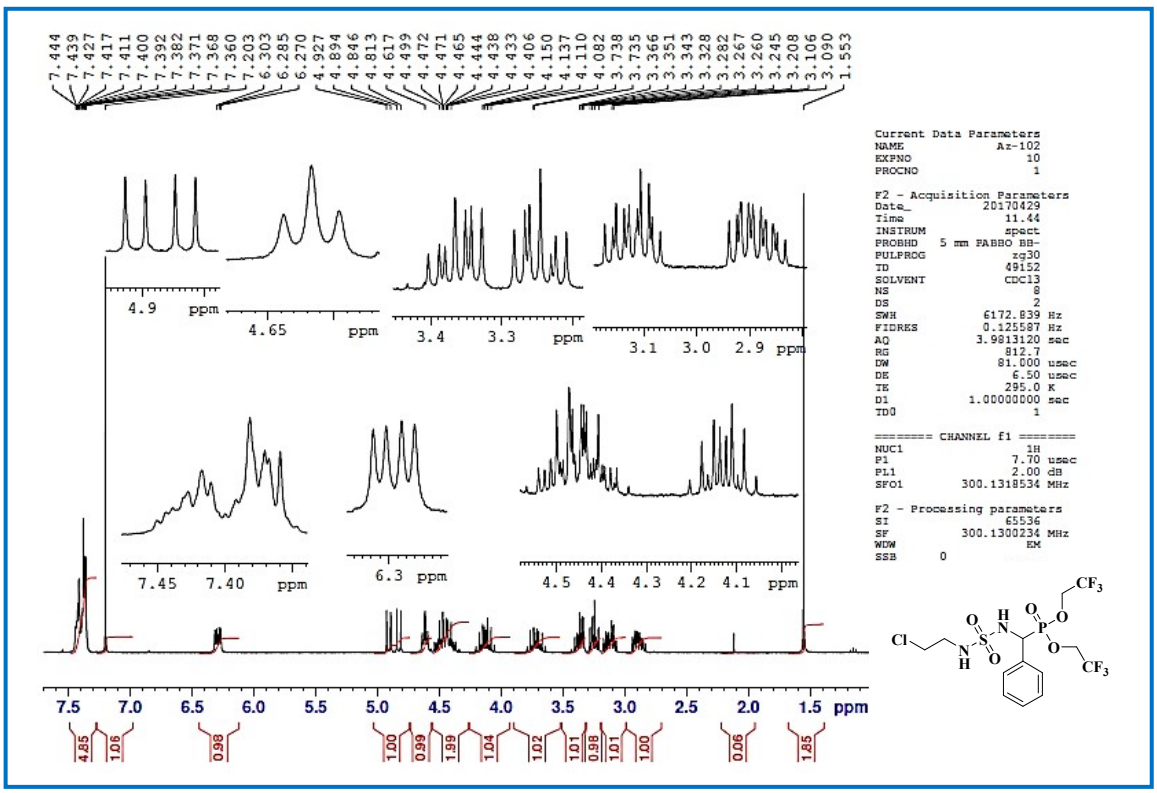
[31]P NMR Spectrum: *Diisopropyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16o)**



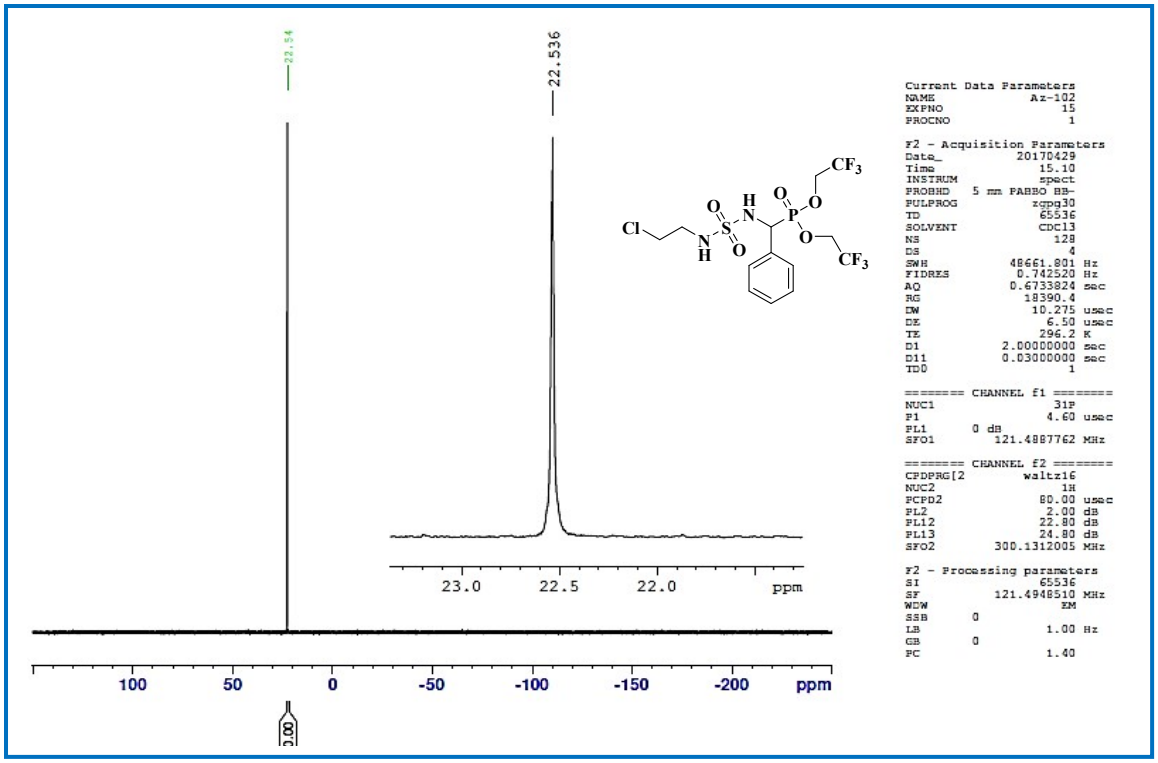
IR Spectrum: *Diisopropyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16o)**



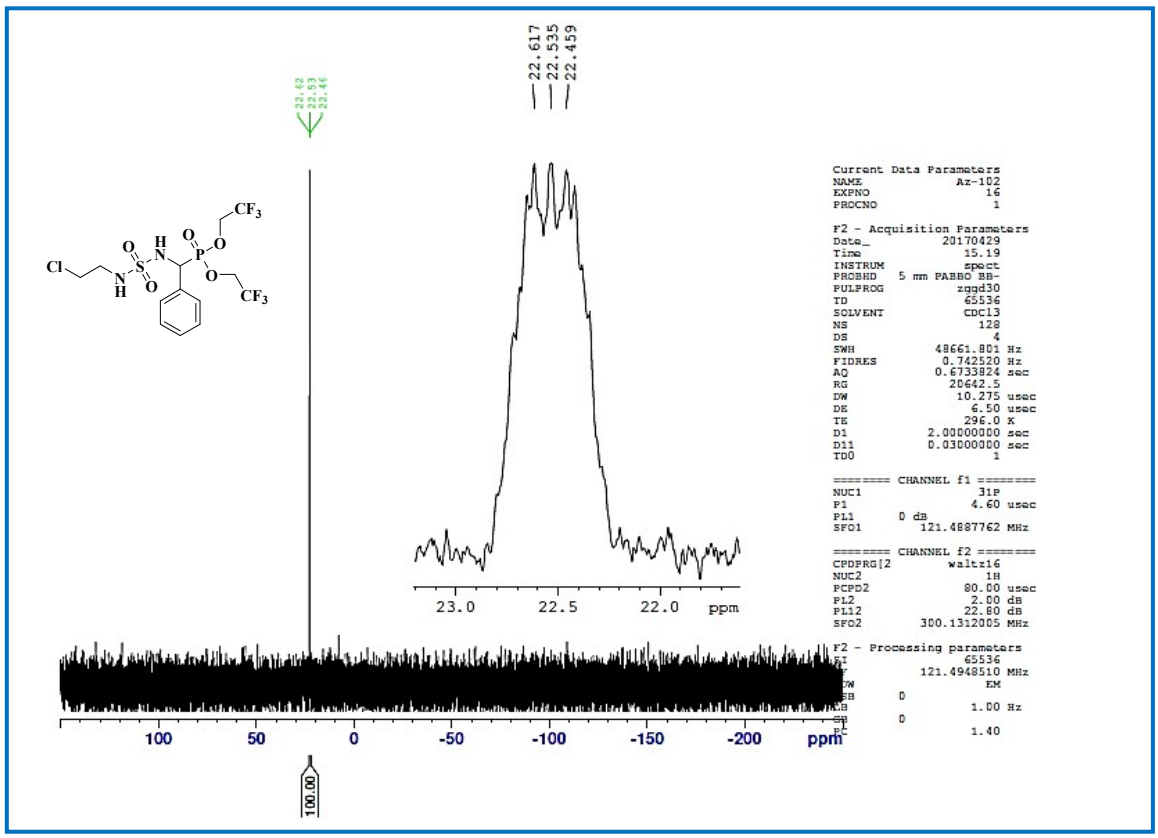
MS Spectrum: *Diisopropyl (((N-(2-chloroethyl)sulfamoyl)amino)(phenyl)methyl)phosphonate* **(16o)**



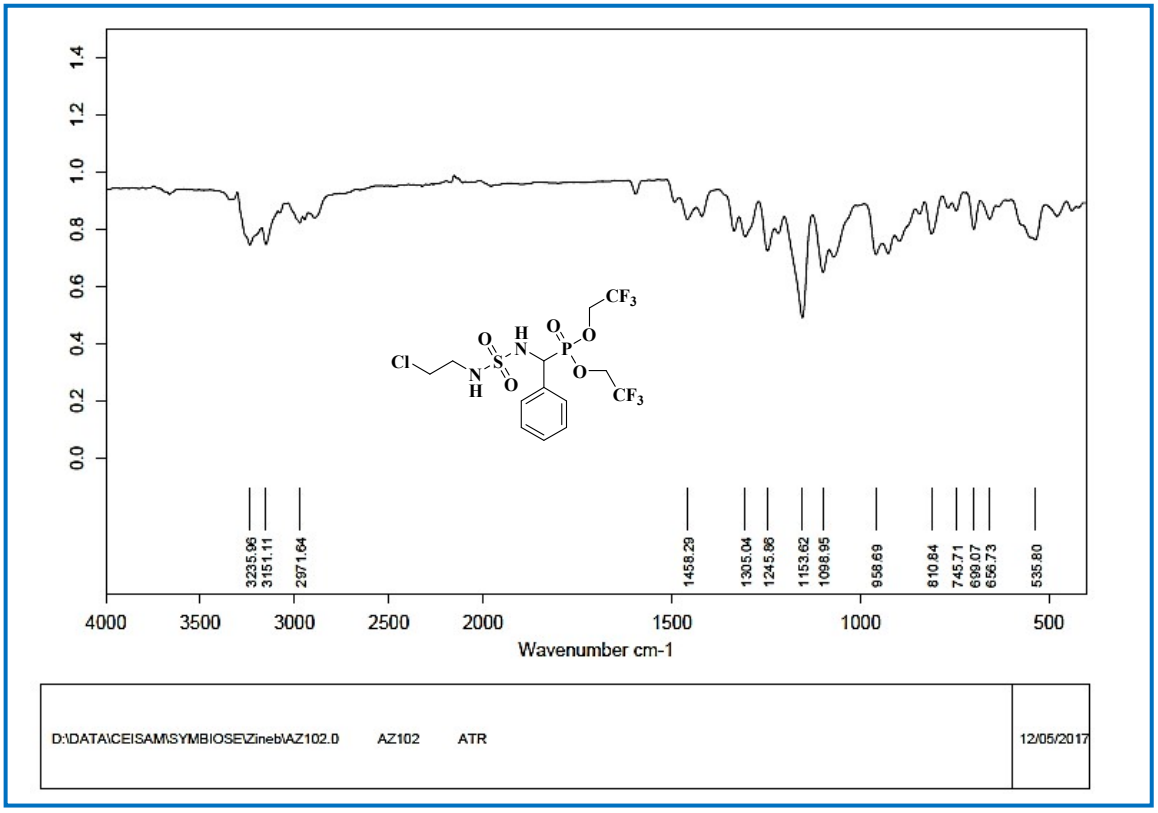
^{1}H NMR Spectrum: *Bis (2,2,2-trifluoroethyl) (((N-(2-chloroethyl) sulfamoyl) amino) (phenyl) methyl) phosphonate* **(16p)**



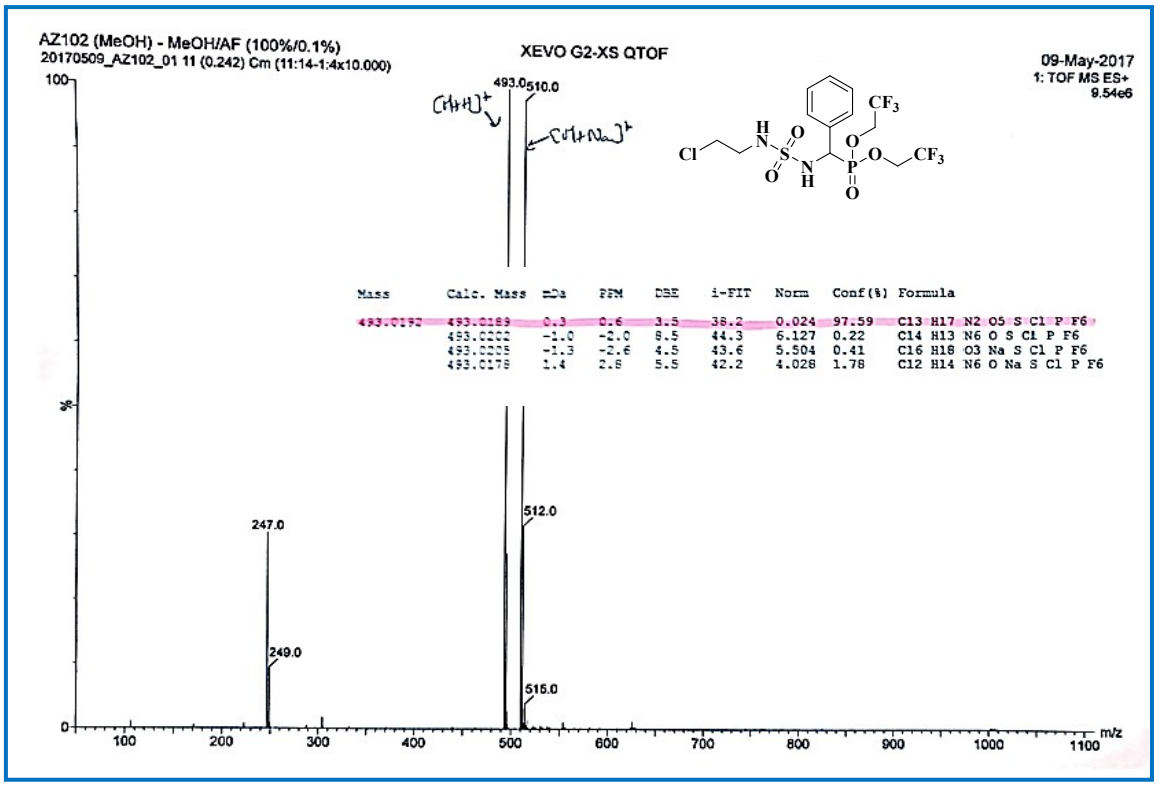
[31]P NMR Spectrum: *Bis (2,2,2-trifluoroethyl) (((N-(2-chloroethyl) sulfamoyl) amino) (phenyl) methyl) phosphonate* **(16p)**



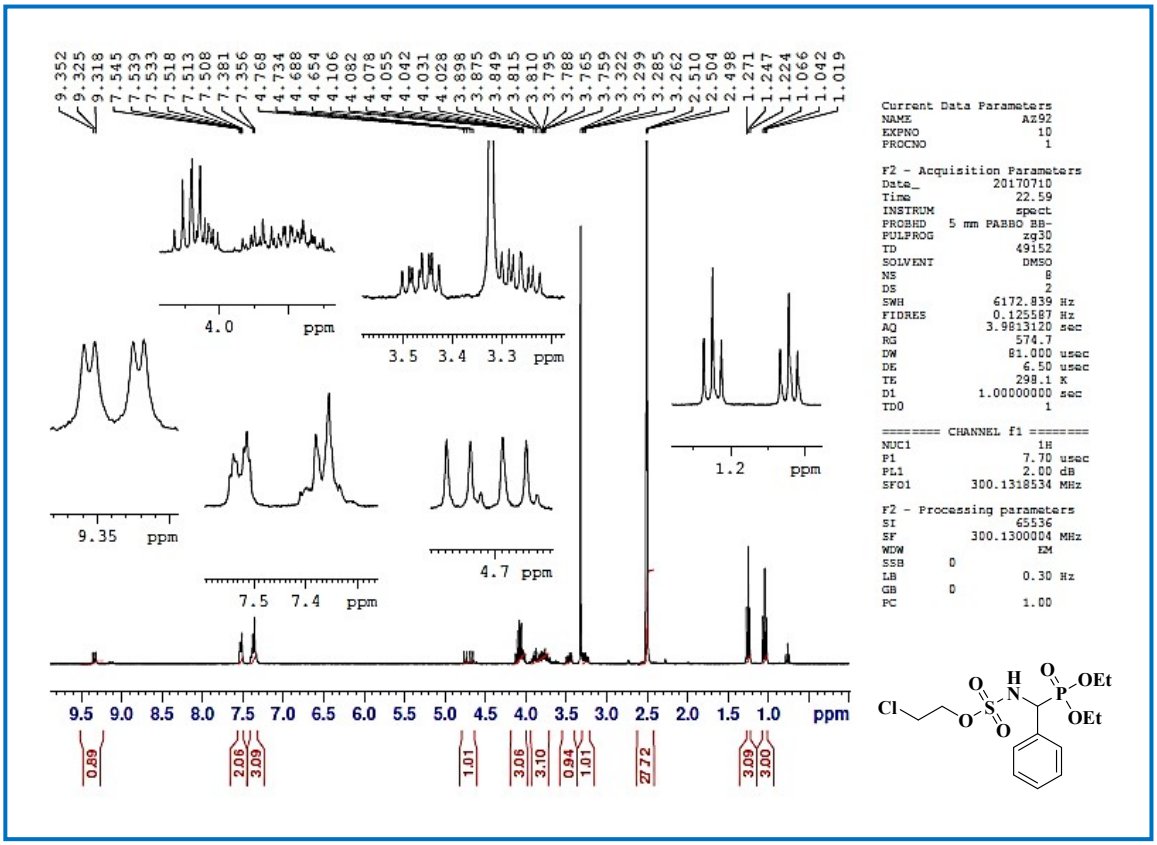
[31]P NMR Spectrum: *Bis (2,2,2-trifluoroethyl) (((N-(2-chloroethyl) sulfamoyl) amino) (phenyl) methyl) phosphonate* **(16p)**



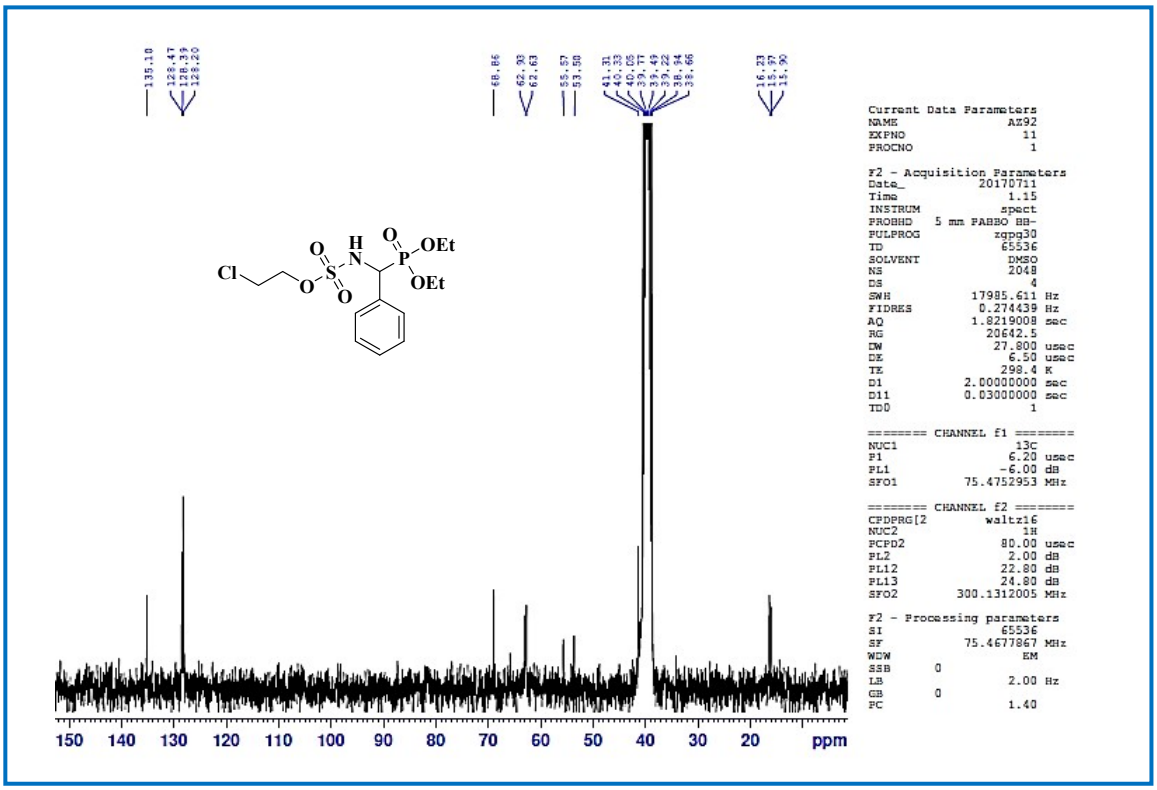
IR Spectrum: *Bis (2,2,2-trifluoroethyl) (((N-(2-chloroethyl) sulfamoyl) amino) (phenyl) methyl) phosphonate* **(16p)**



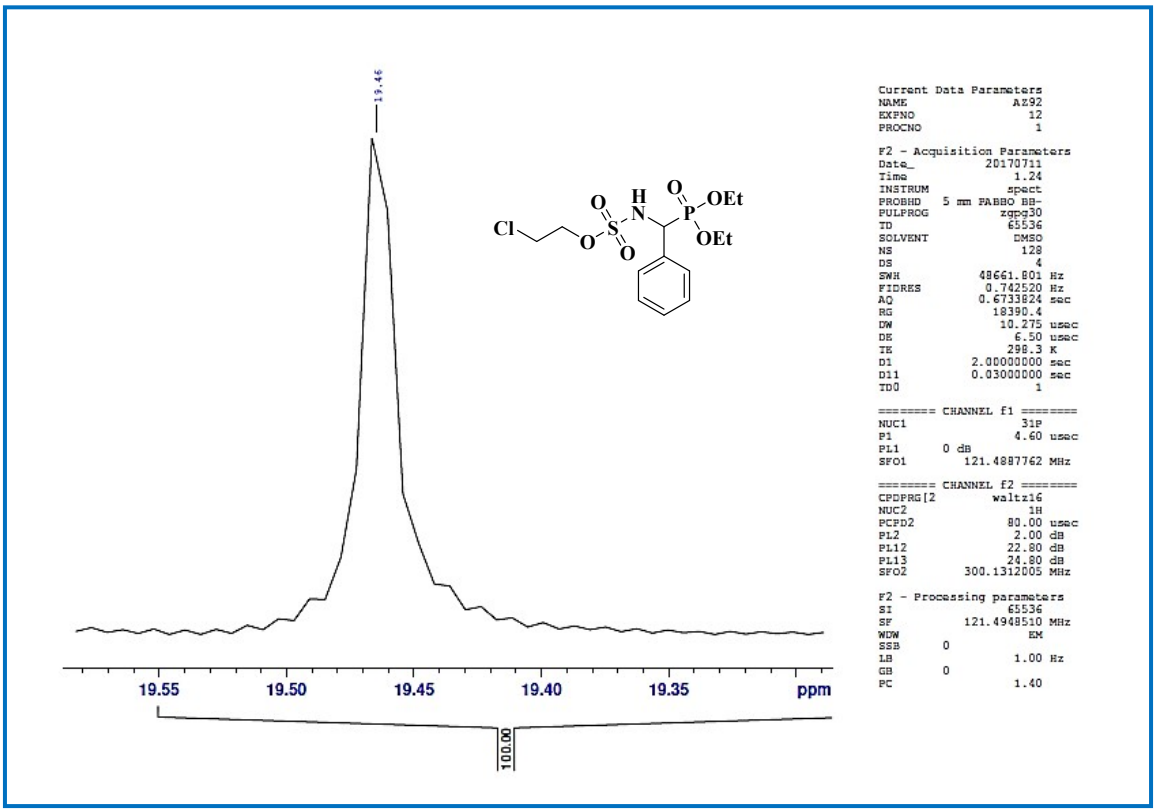
MS Spectrum: *Bis (2,2,2-trifluoroethyl) (((N-(2-chloroethyl) sulfamoyl) amino) (phenyl) methyl) Phosphonate* **(16p)**



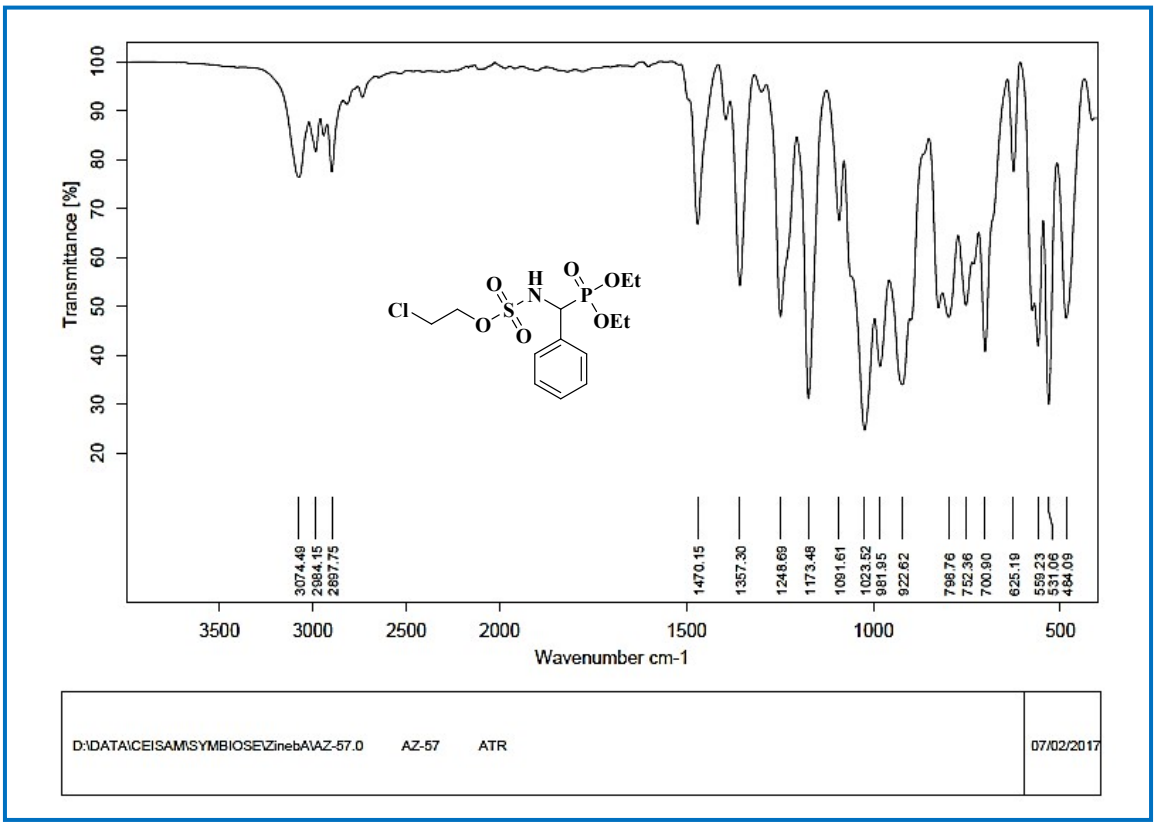
*[1]**H NMR Spectrum:** 2-Chloroethyl ((diethoxyphosphoryl)(phenyl)methyl)sulfamate* **(18a)**



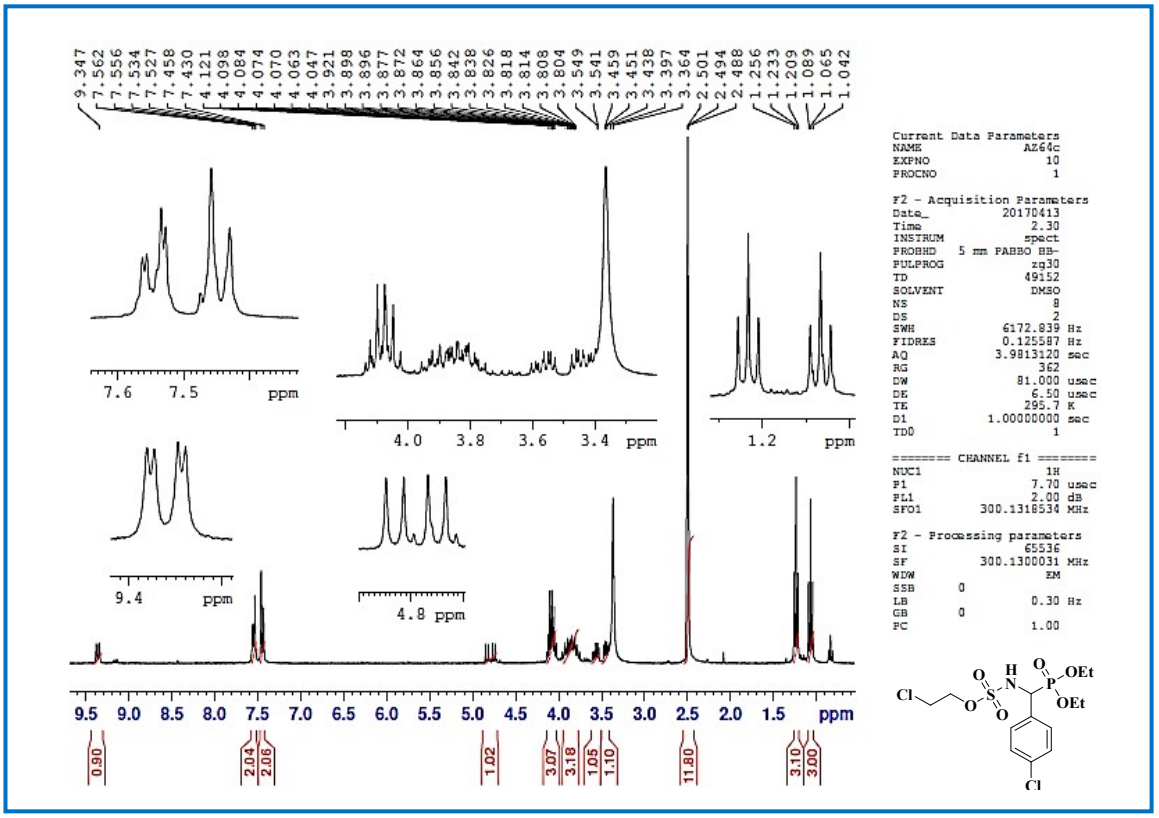
*[13]**C NMR Spectrum:** 2-Chloroethyl ((diethoxyphosphoryl)(phenyl)methyl)sulfamate* **(18a)**



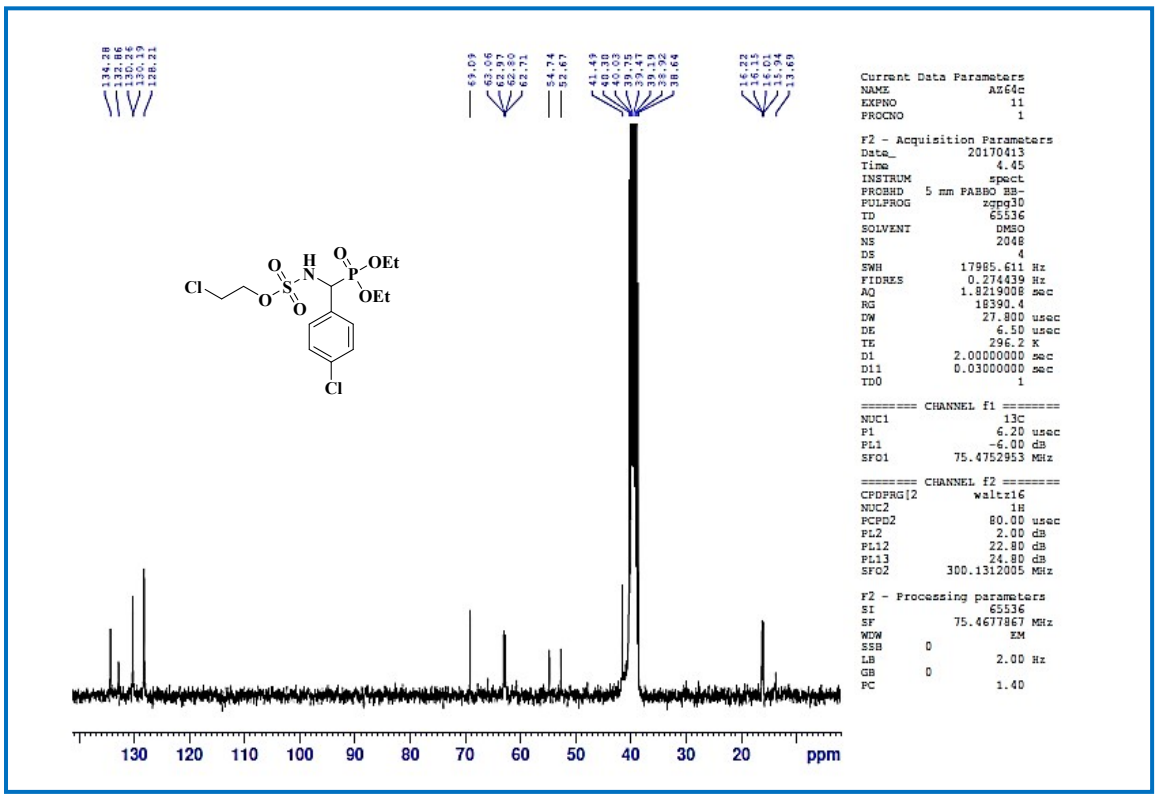
*[31]**P NMR Spectrum:** 2-Chloroethyl ((diethoxyphosphoryl)(phenyl)methyl)sulfamate* **(18a)**



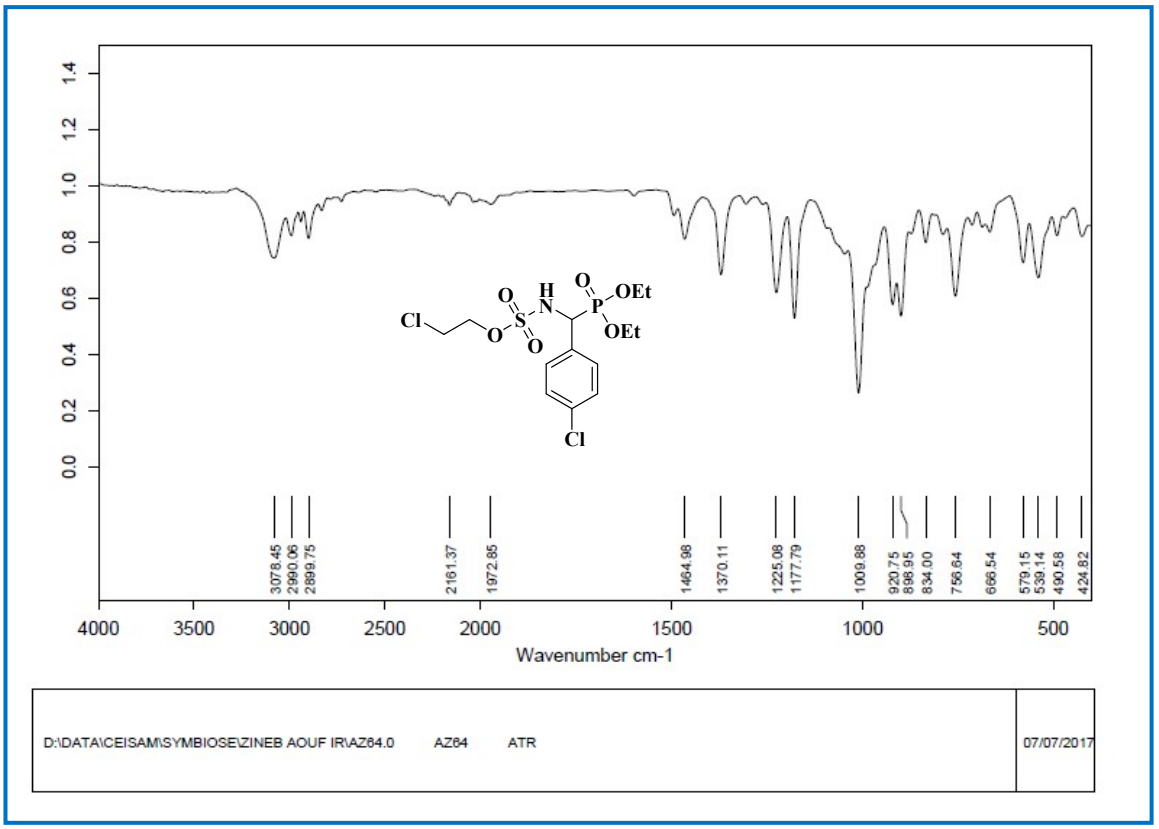
***IR Spectrum:** 2-Chloroethyl ((diethoxyphosphoryl)(phenyl)methyl)sulfamate* **(18a)**



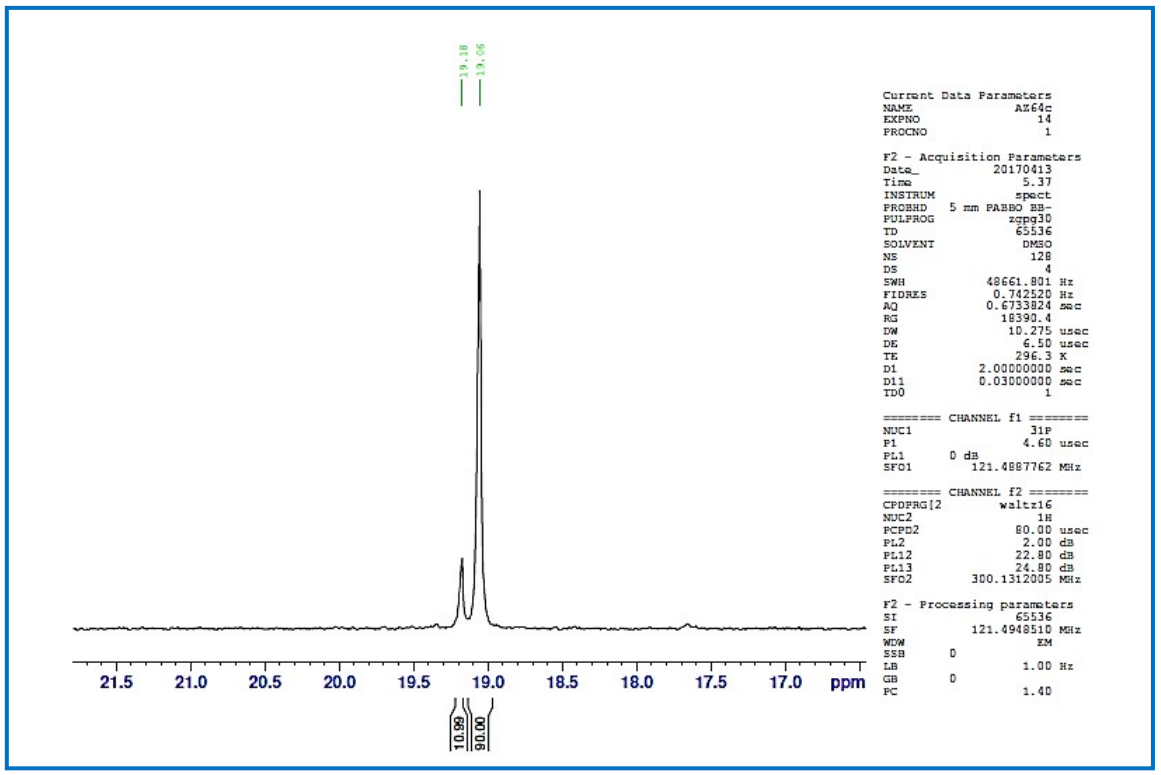
[1]H NMR Spectrum: *2-Chloroethyl ((4-chlorophenyl)(diethoxyphosphoryl)methyl)sulfamate* **(18c)**



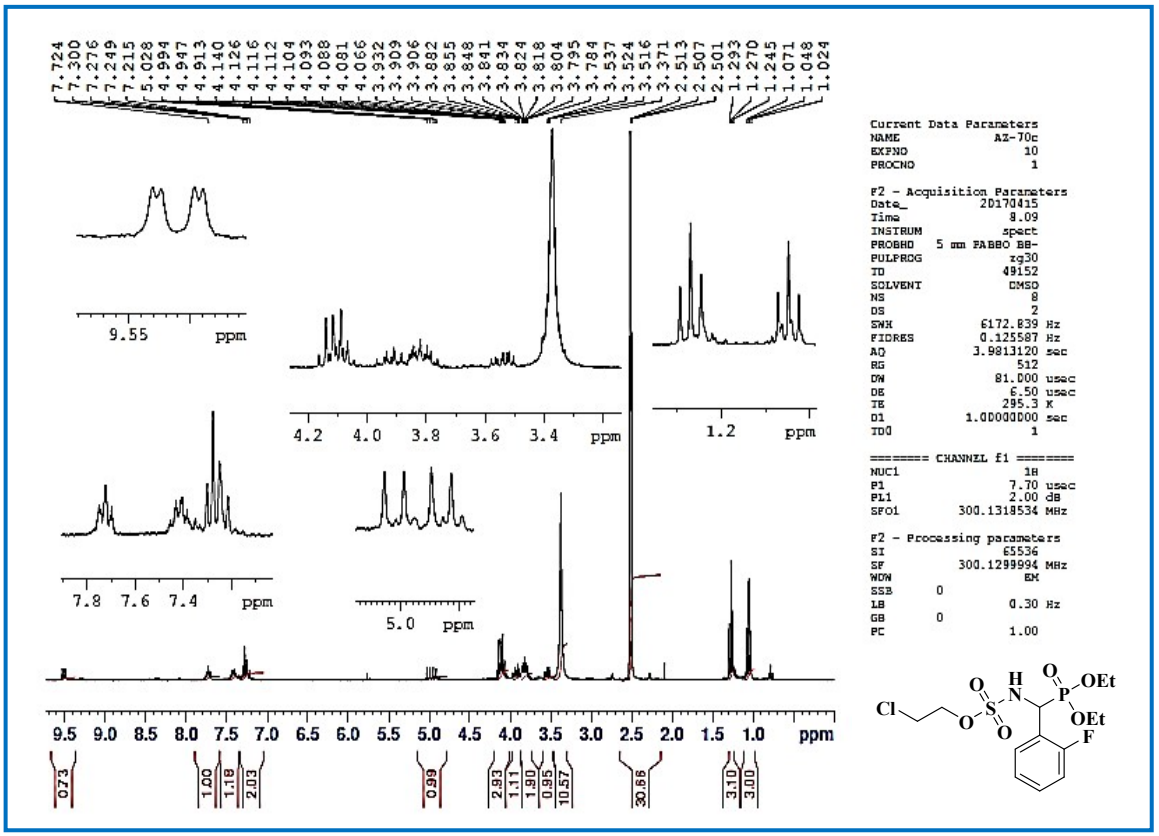
[13]C NMR Spectrum: *2-Chloroethyl ((4-chlorophenyl)(diethoxyphosphoryl)methyl)sulfamate* **(18c)**



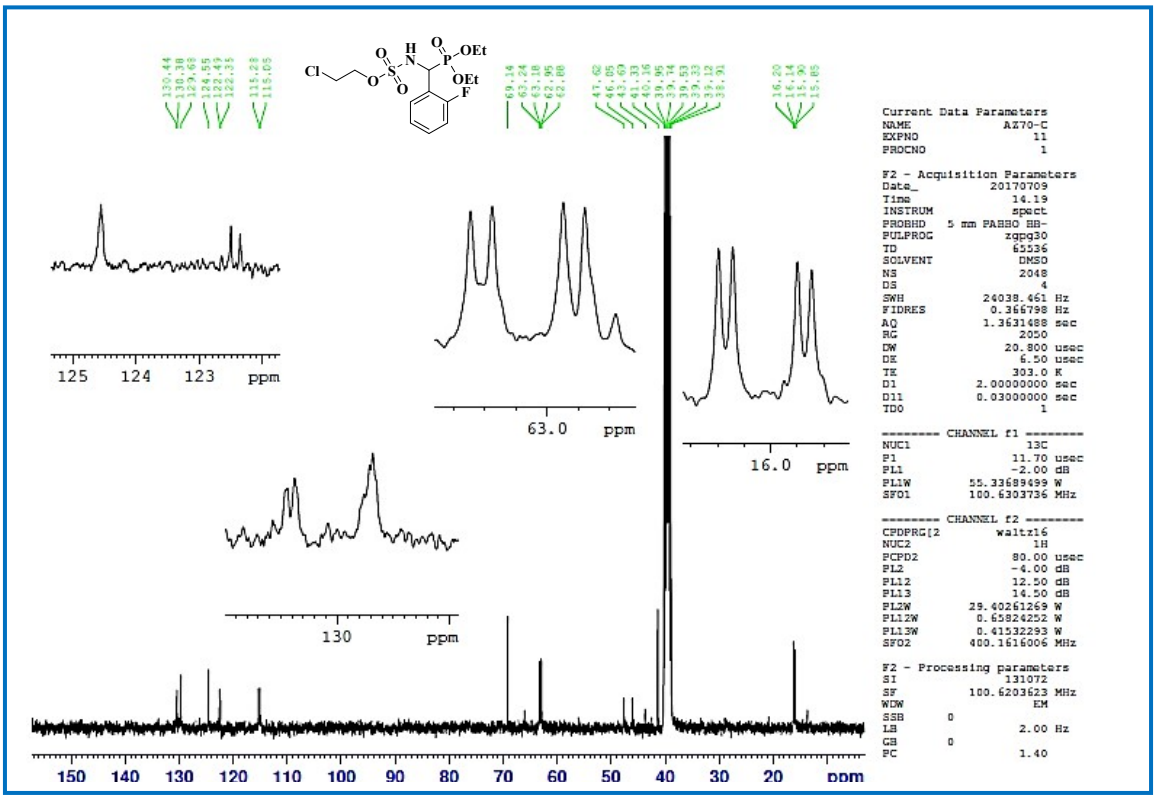
IR Spectrum: *2-Chloroethyl ((4-chlorophenyl)(diethoxyphosphoryl)methyl)sulfamate* **(18c)**



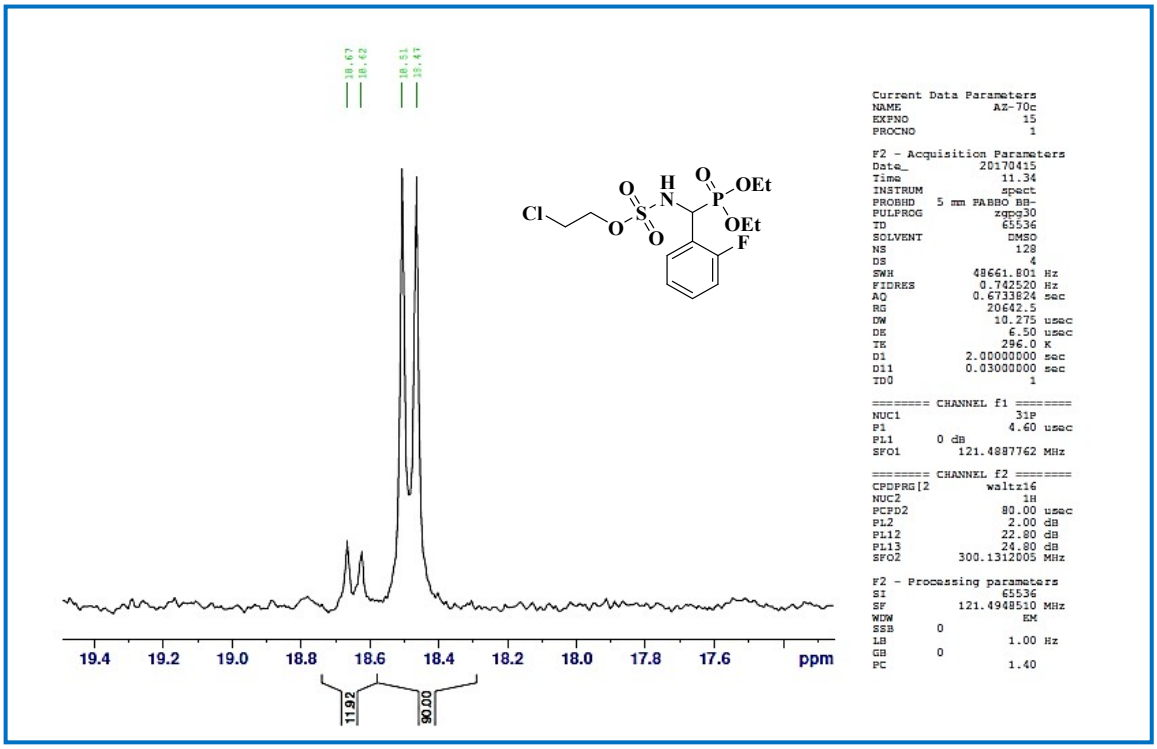
NMR P^{31} Spectrum: *2-Chloroethyl ((4-chlorophenyl)(diethoxyphosphoryl)methyl)sulfamate* **(18c)**



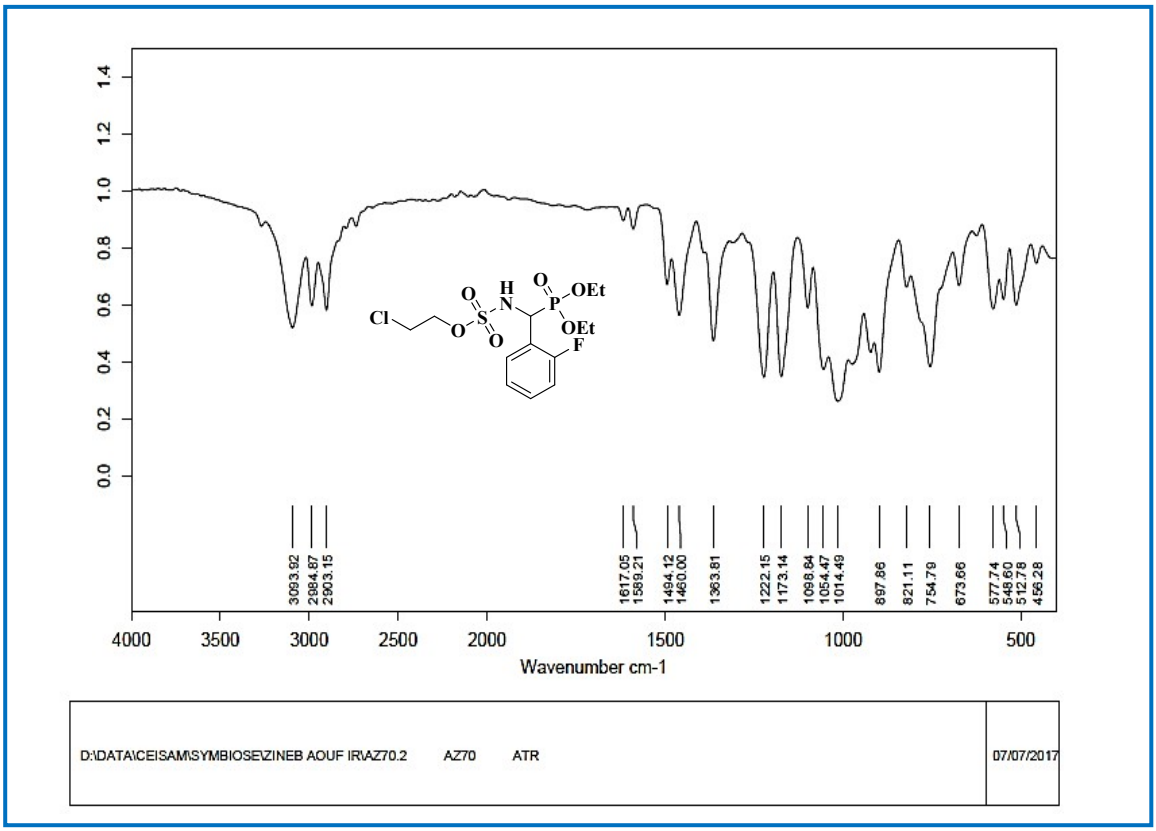
[1]H NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(2-fluorophenyl)methyl)sulfamate* **(18d)**



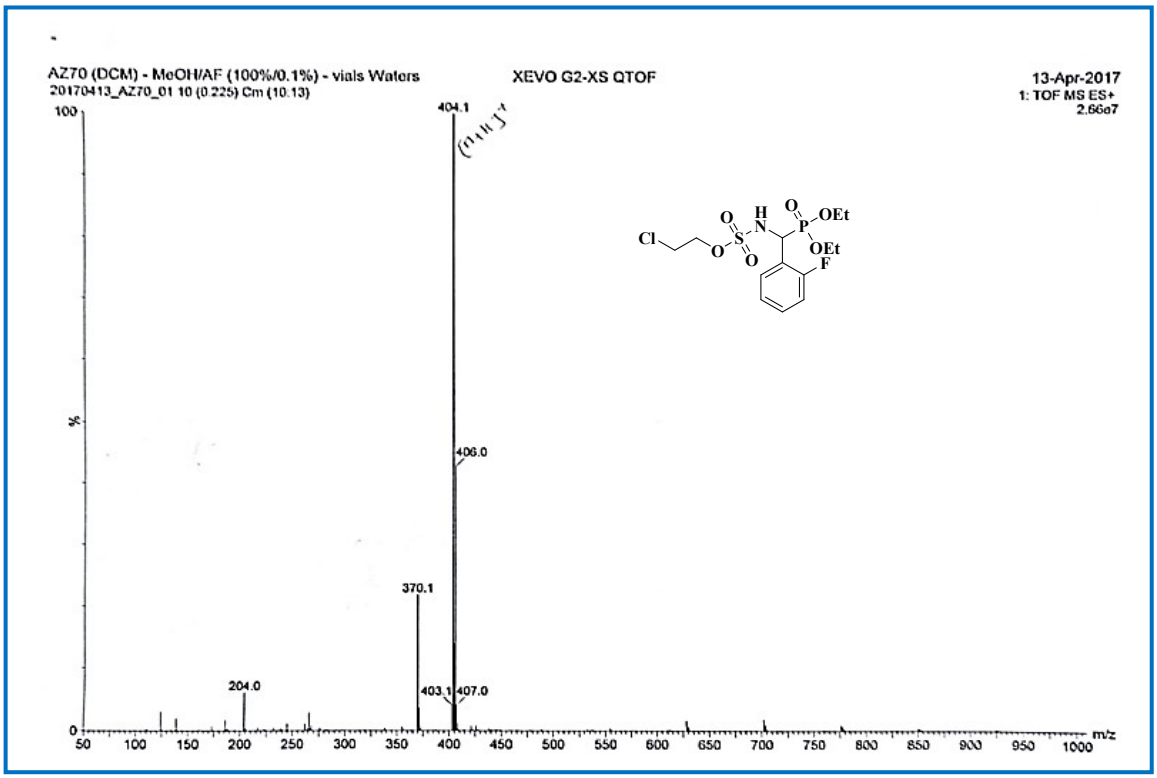
[13]C NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(2-fluorophenyl)methyl)sulfamate* **(18d)**



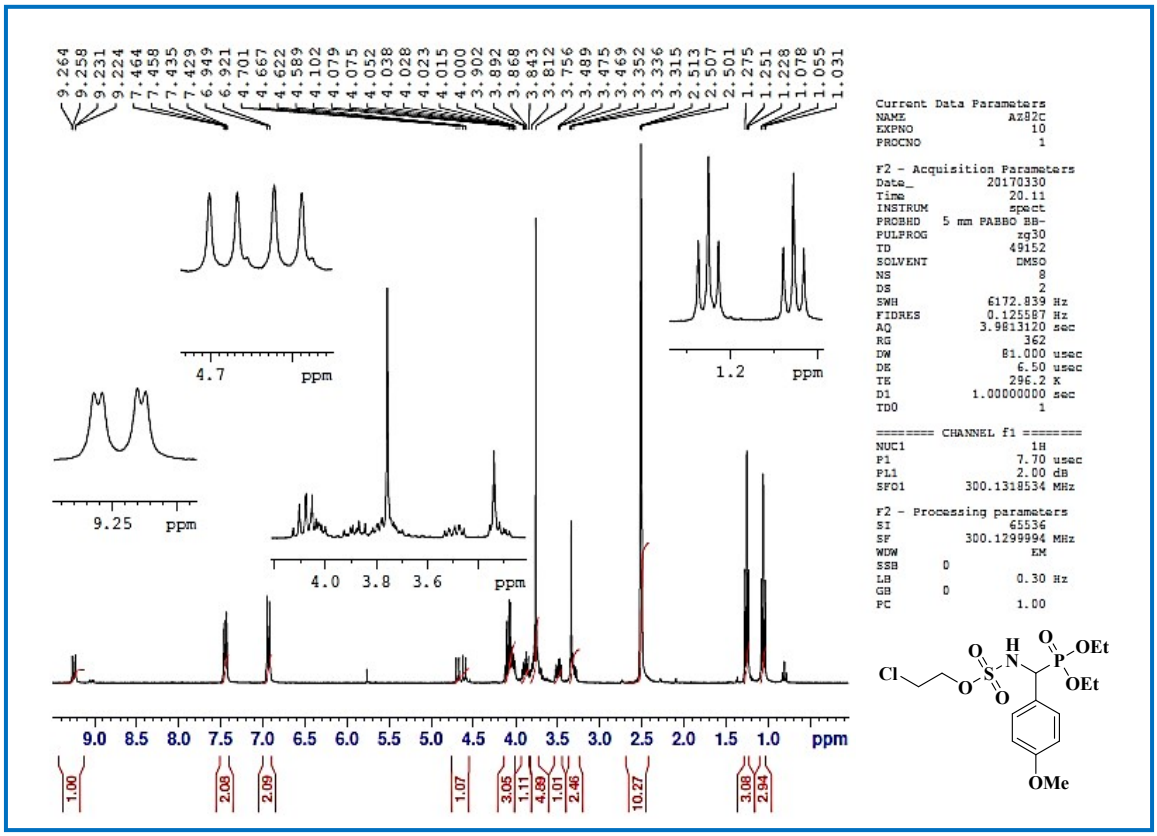
^{31}P NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(2-fluorophenyl)methyl)sulfamate* **(18d)**



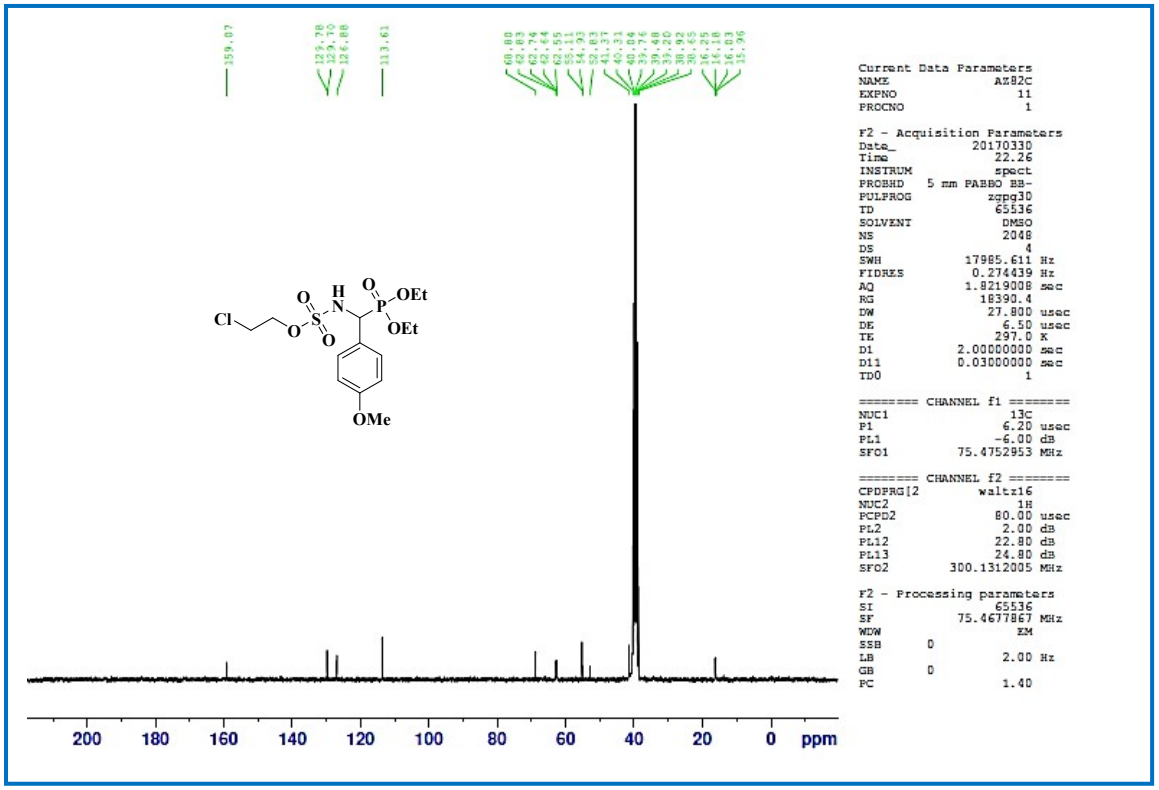
IR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(2-fluorophenyl)methyl)sulfamate* **(18d)**



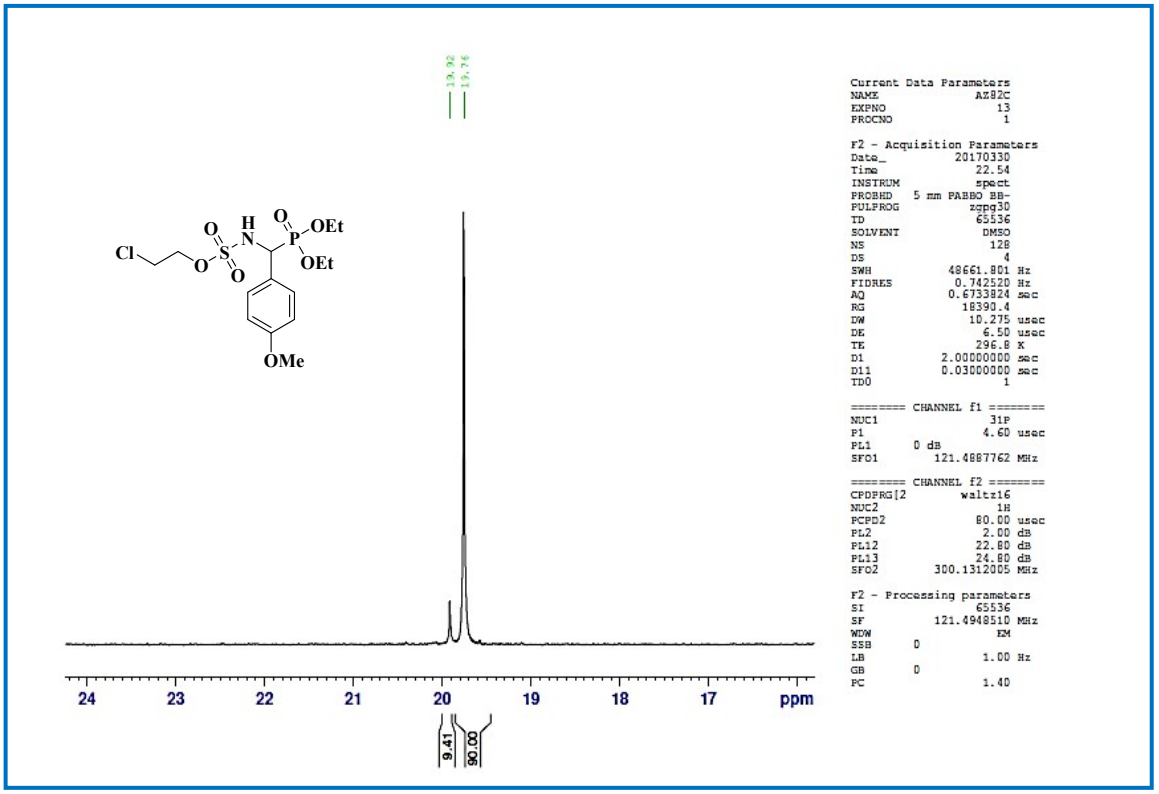
MS Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(2-fluorophenyl)methyl)sulfamate* **(18d)**



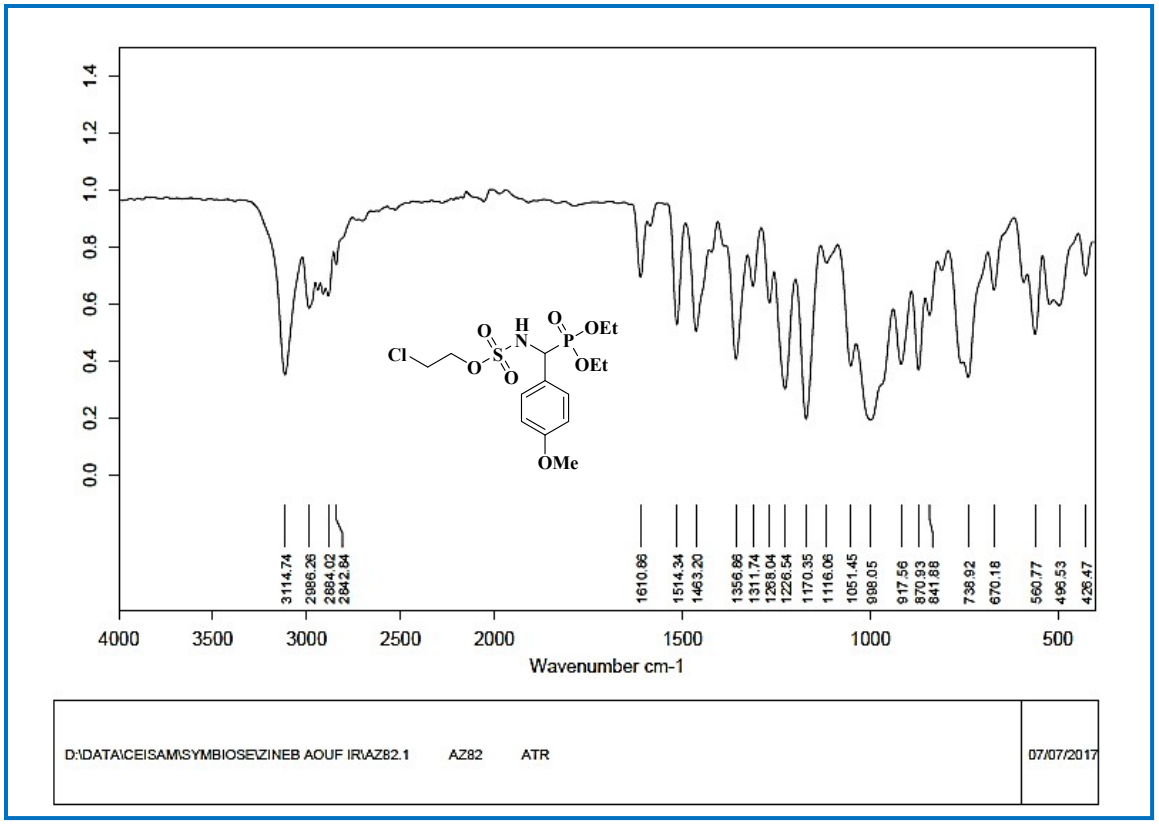
[1]H NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(4-methoxyphenyl)methyl)sulfamate* **(18e)**



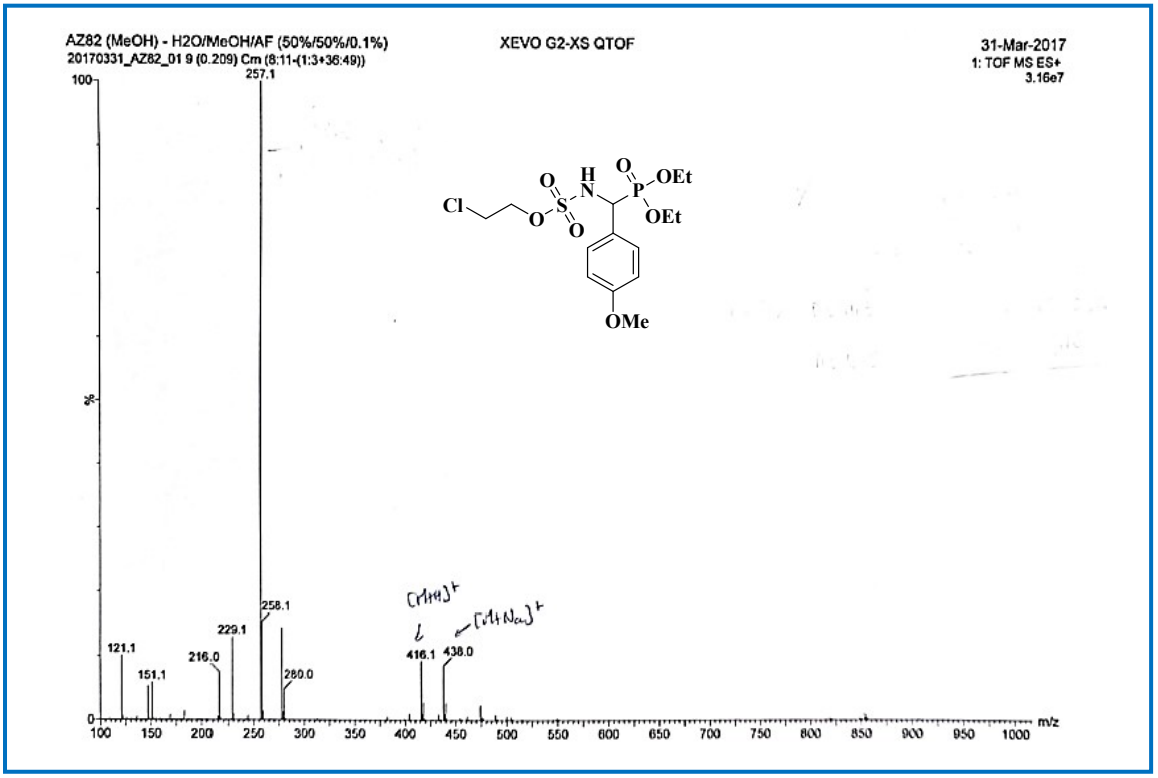
[13]C NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(4-methoxyphenyl)methyl)sulfamate* **(18e)**



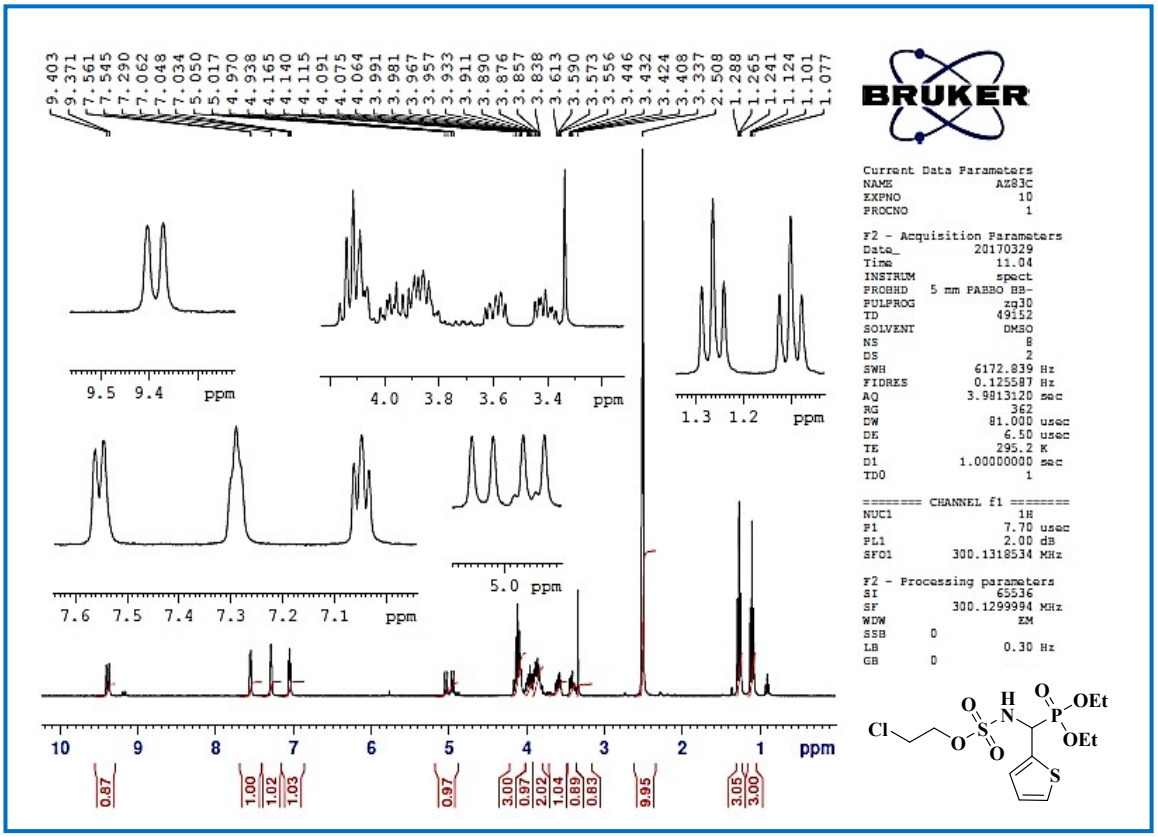
[31]P NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(4-methoxyphenyl)methyl)sulfamate* **(18e)**



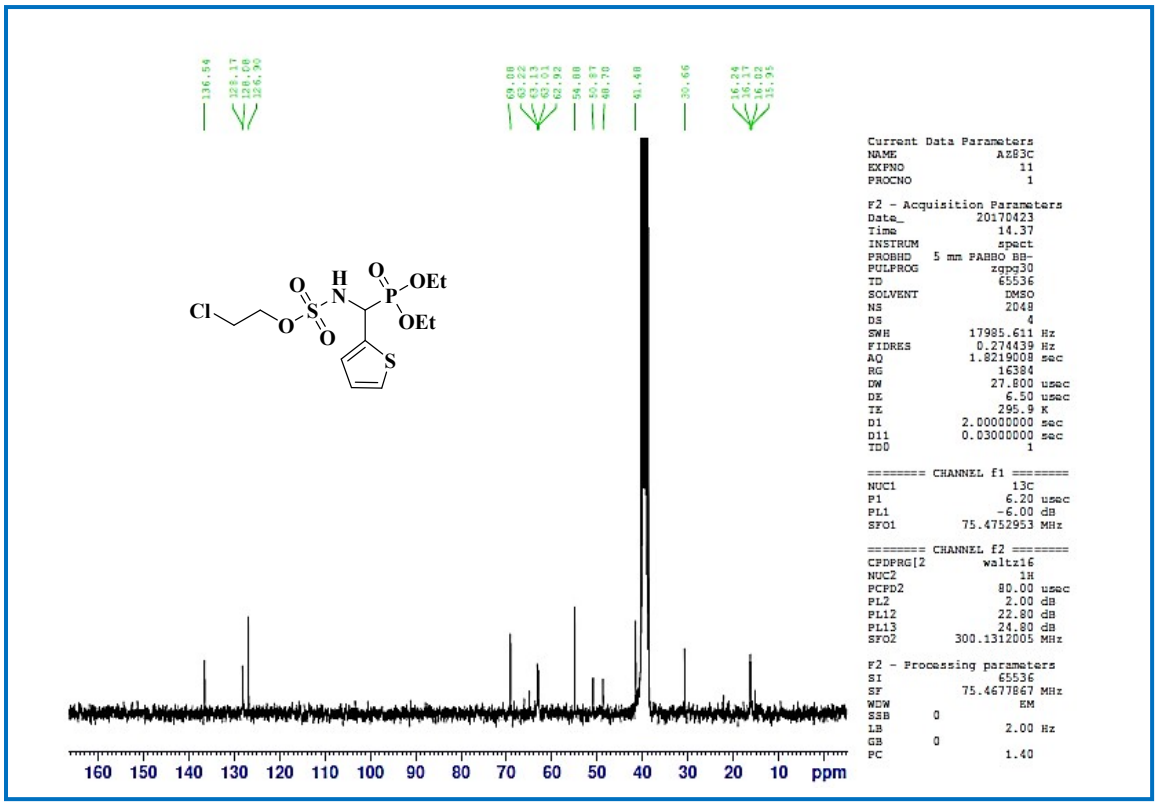
IR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(4-methoxyphenyl)methyl)sulfamate* **(18e)**



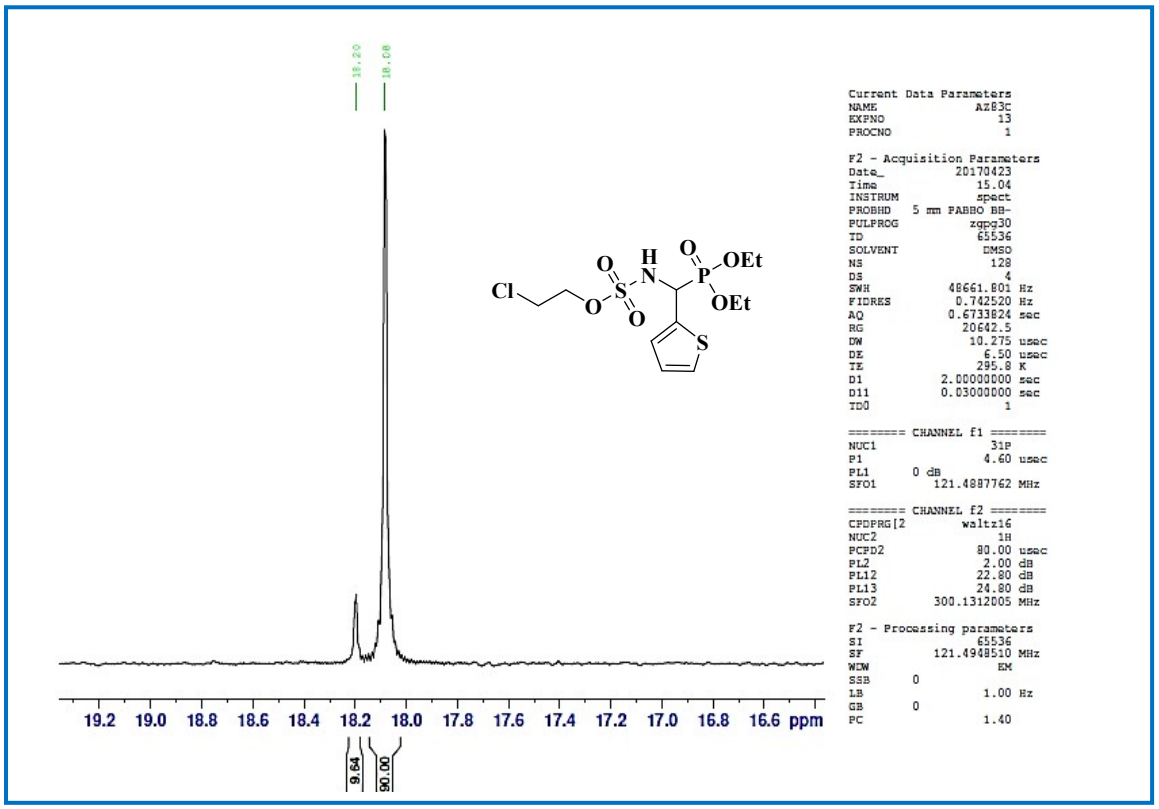
MS Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(4-methoxyphenyl)methyl)sulfamate* **(18e)**



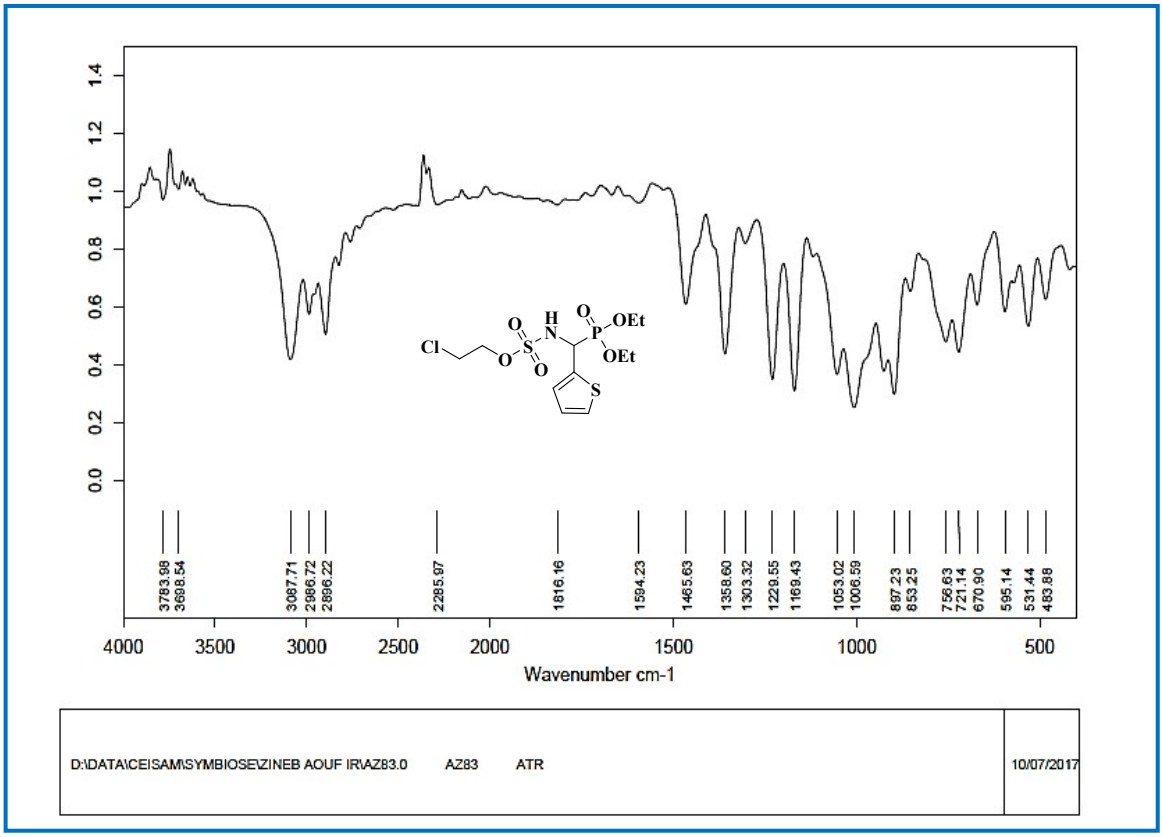
[1]H NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(thiophen-2-yl)methyl)sulfamate* **(18k)**



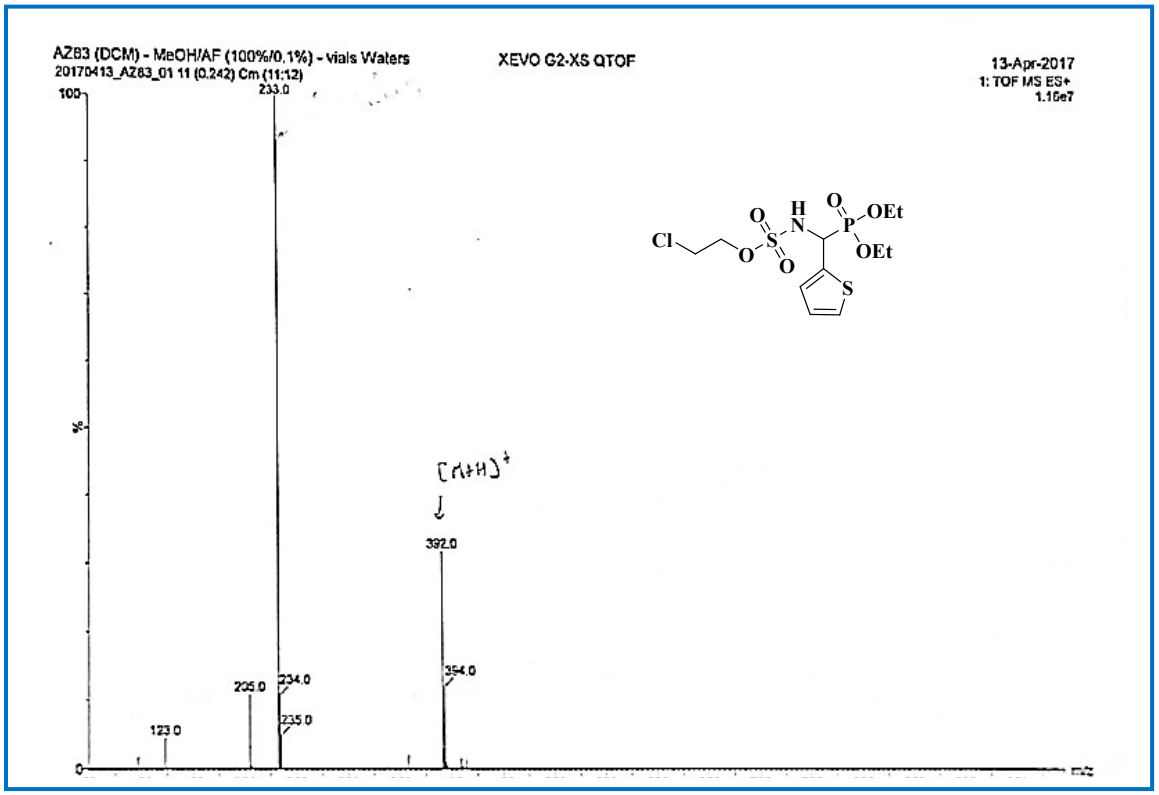
[13]C NMR Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(thiophen-2-yl)methyl)sulfamate* **(18k)**



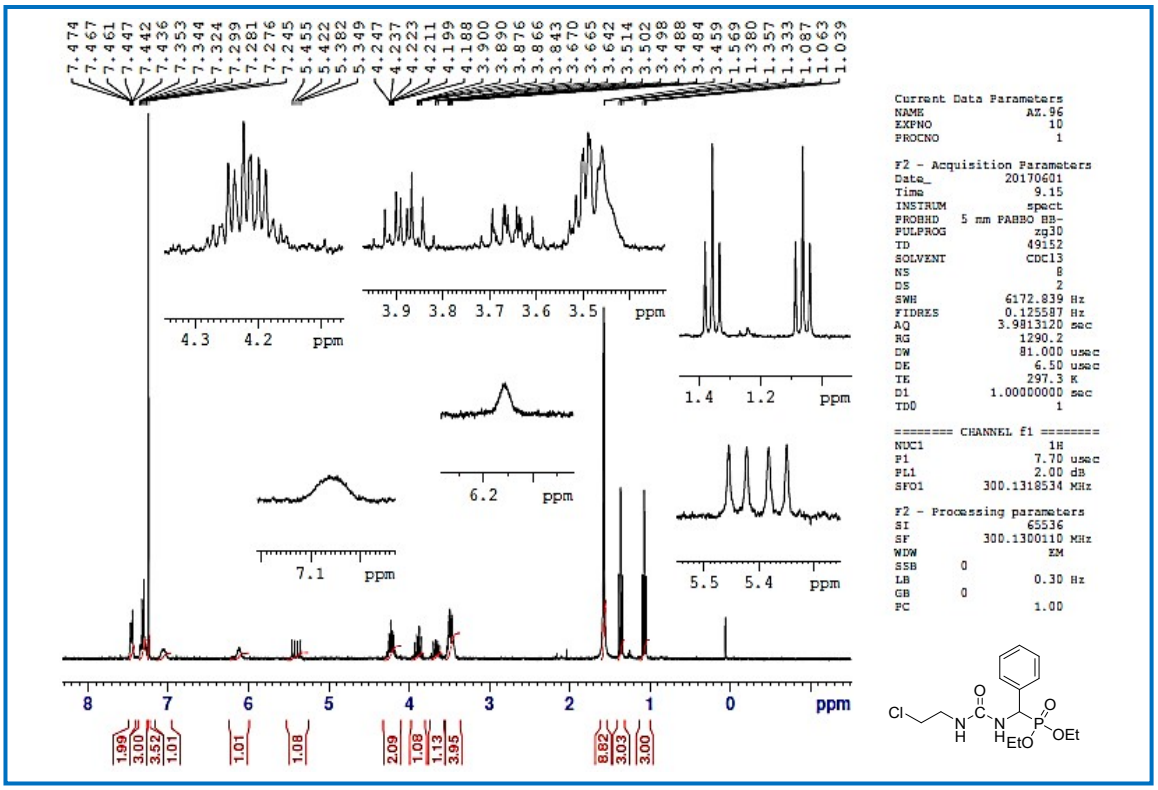
*[31]**P NMR Spectrum:** 2-Chloroethyl ((diethoxyphosphoryl)(thiophen-2-yl)methyl)sulfamate* **(18k)**



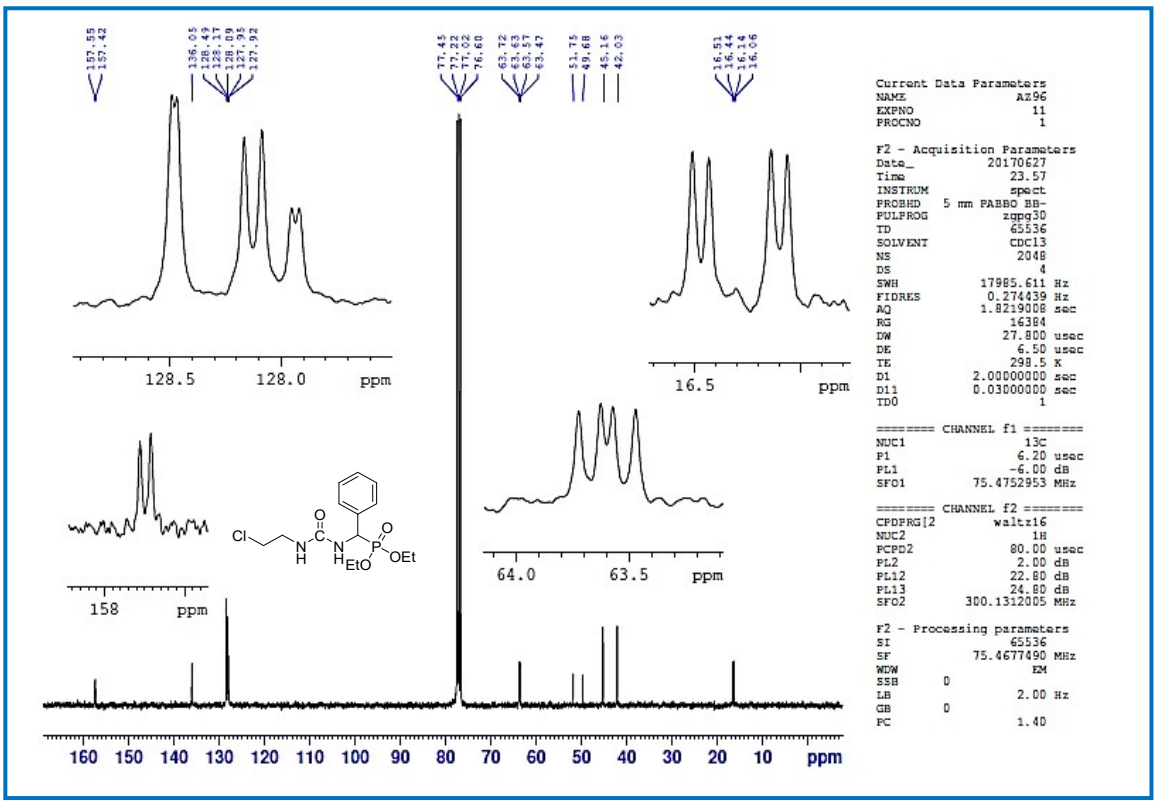
***IR Spectrum:** 2-Chloroethyl ((diethoxyphosphoryl)(thiophen-2-yl)methyl)sulfamate* **(18k)**



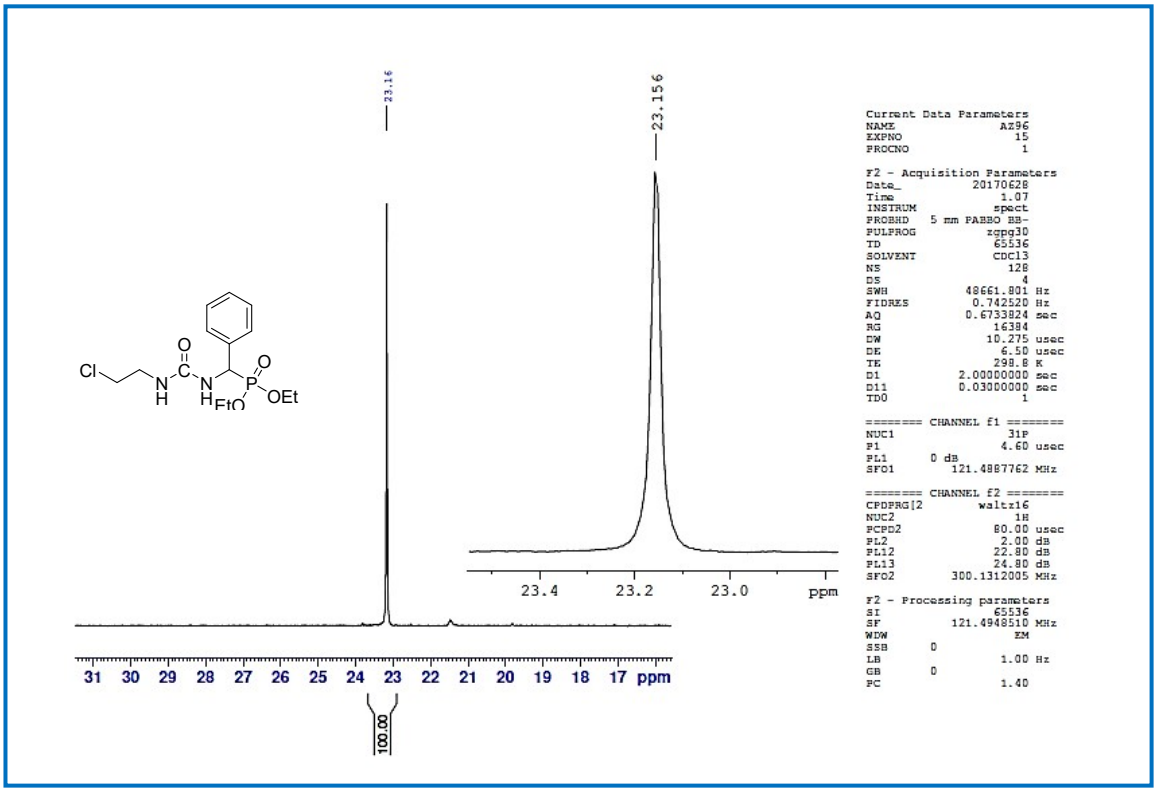
MS Spectrum: *2-Chloroethyl ((diethoxyphosphoryl)(thiophen-2-yl)methyl)sulfamate* **(18k)**



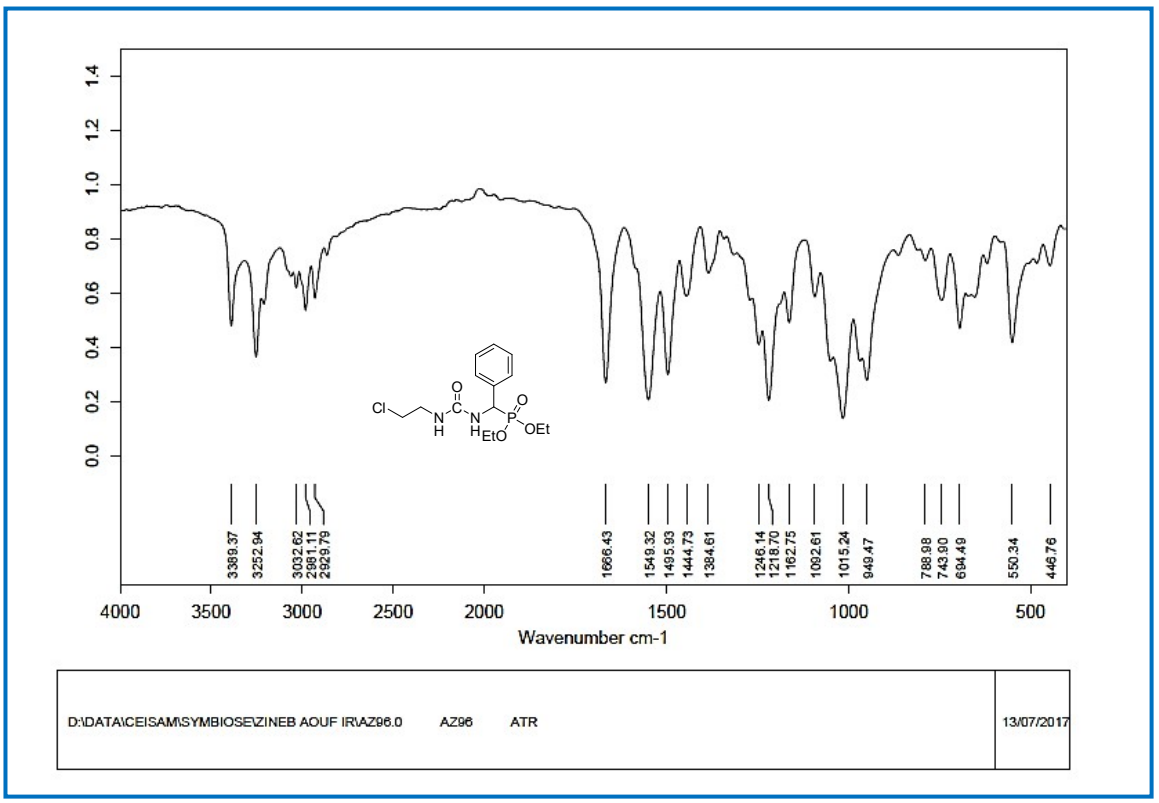
[1]H NMR Spectrum: Diethyl ((3-(2-chloroethyl)ureido)(phenyl)methyl)phosphonate **(20)**



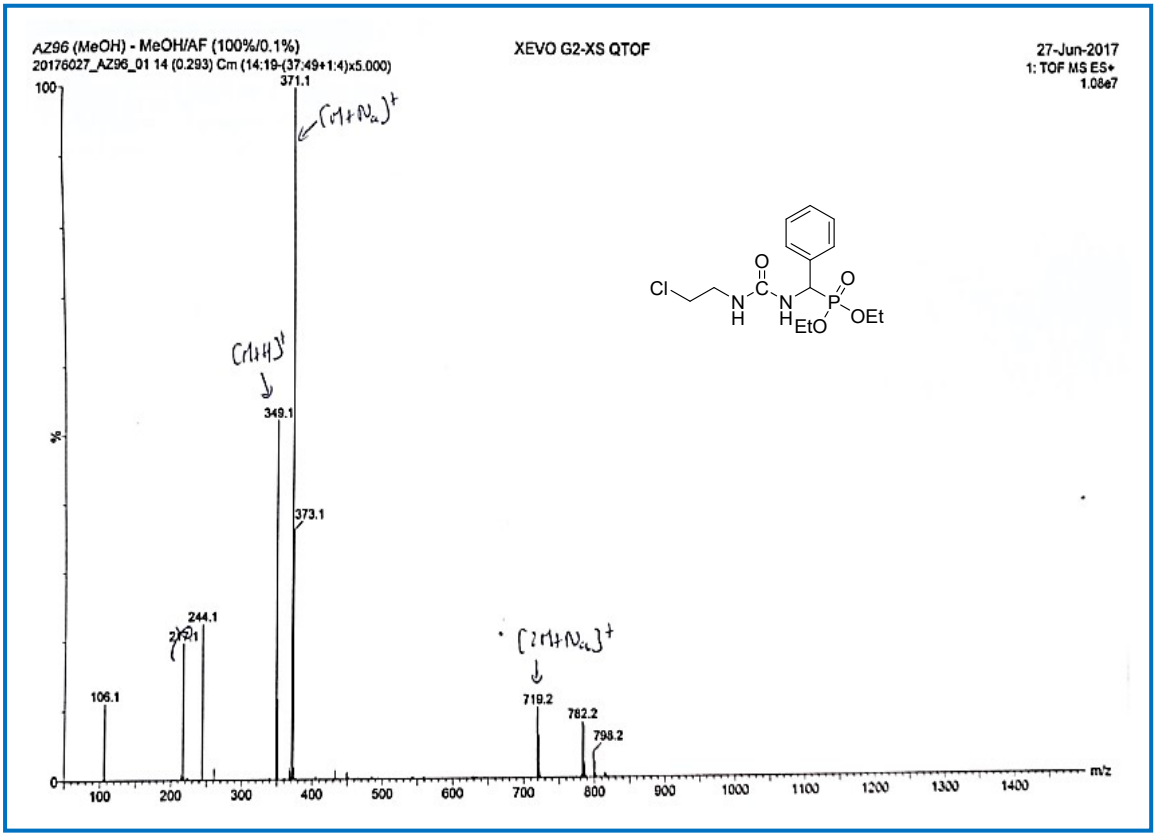
[13]C NMR Spectrum: Diethyl ((3-(2-chloroethyl)ureido)(phenyl)methyl)phosphonate **(20)**



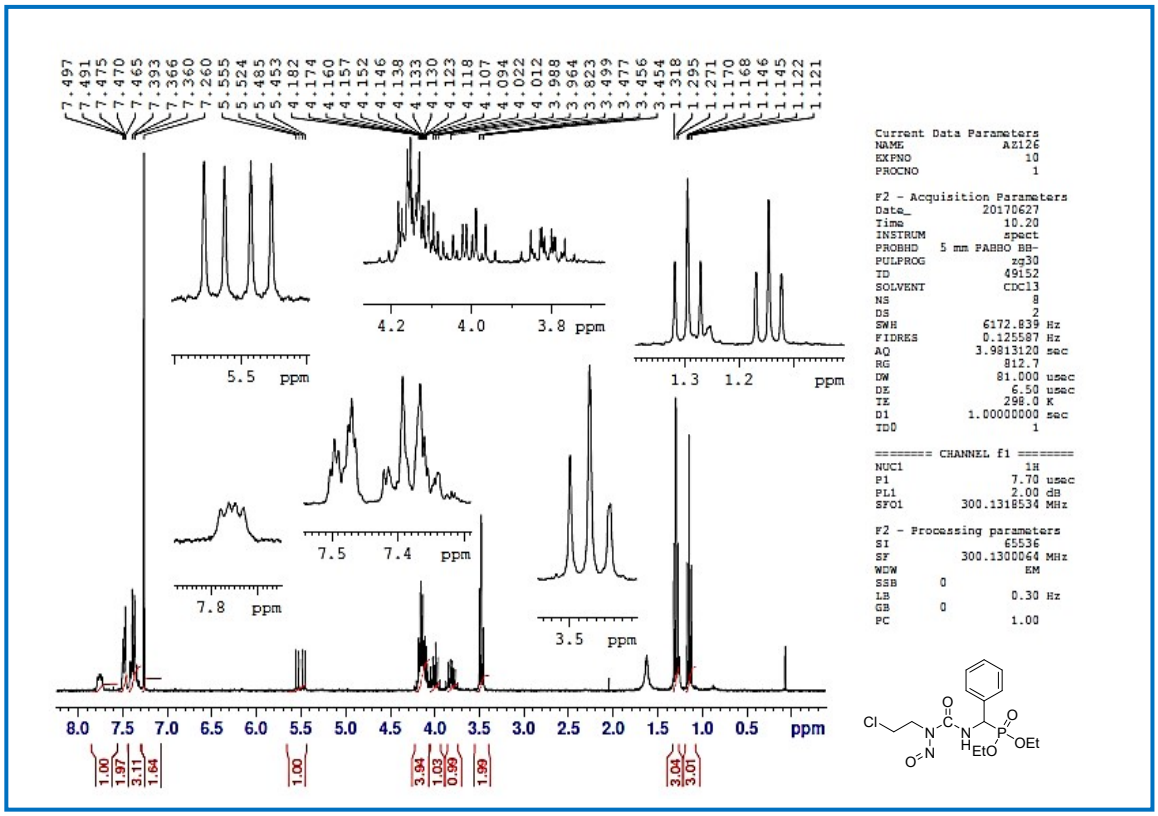
^{31}P NMR Spectrum: Diethyl ((3-(2-chloroethyl)ureido)(phenyl)methyl)phosphonate **(20)**



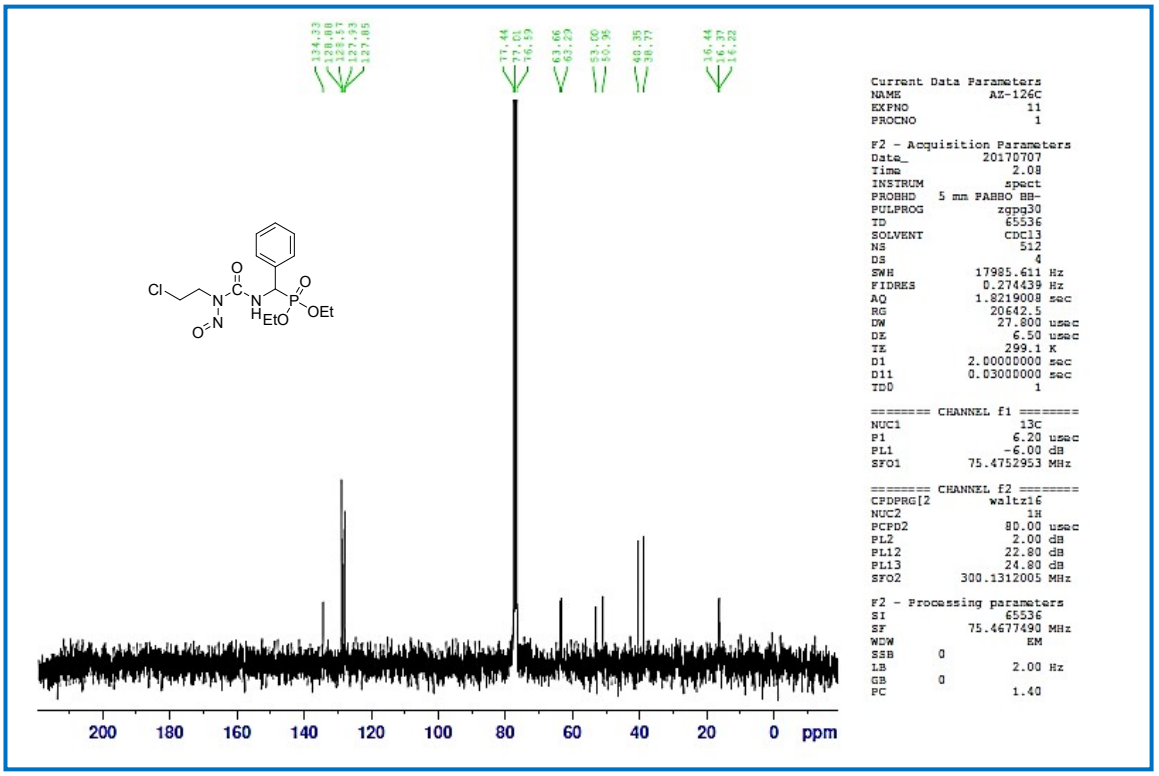
IR Spectrum: Diethyl ((3-(2-chloroethyl)ureido)(phenyl)methyl)phosphonate **(20)**



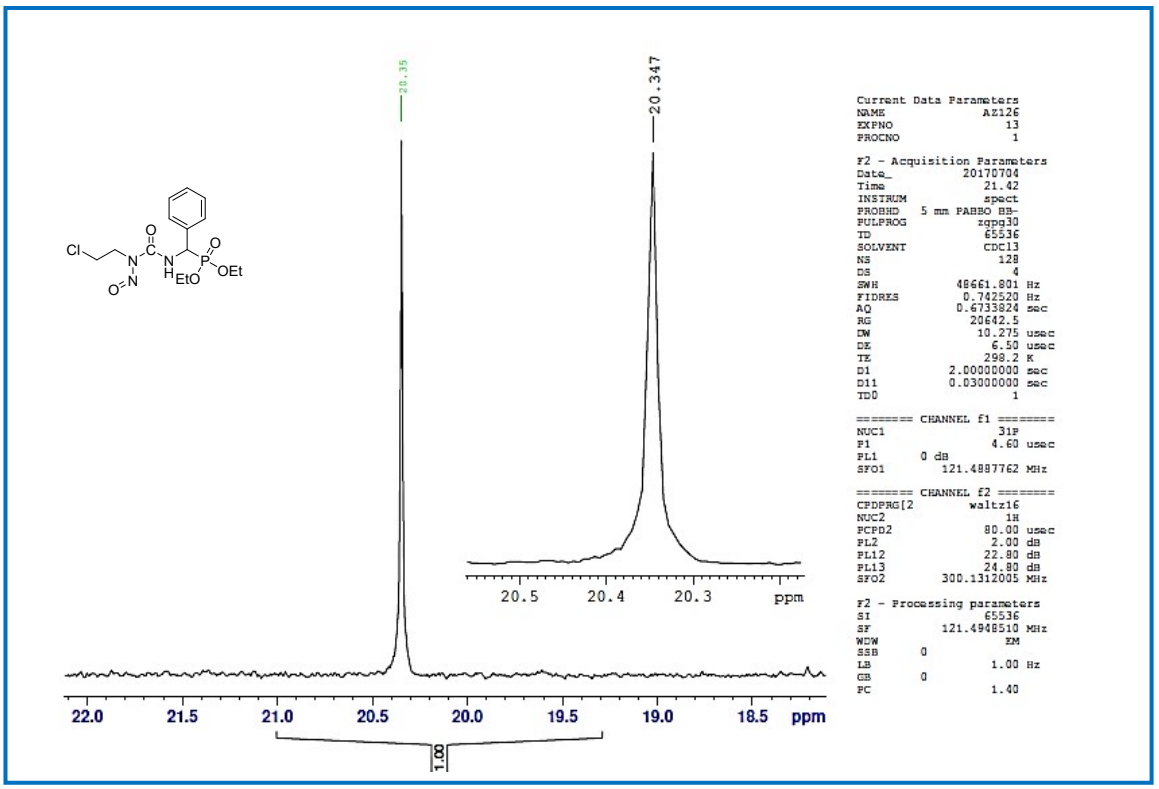
MS Spectrum: Diethyl ((3-(2-chloroethyl)ureido)(phenyl)methyl)phosphonate **(20)**



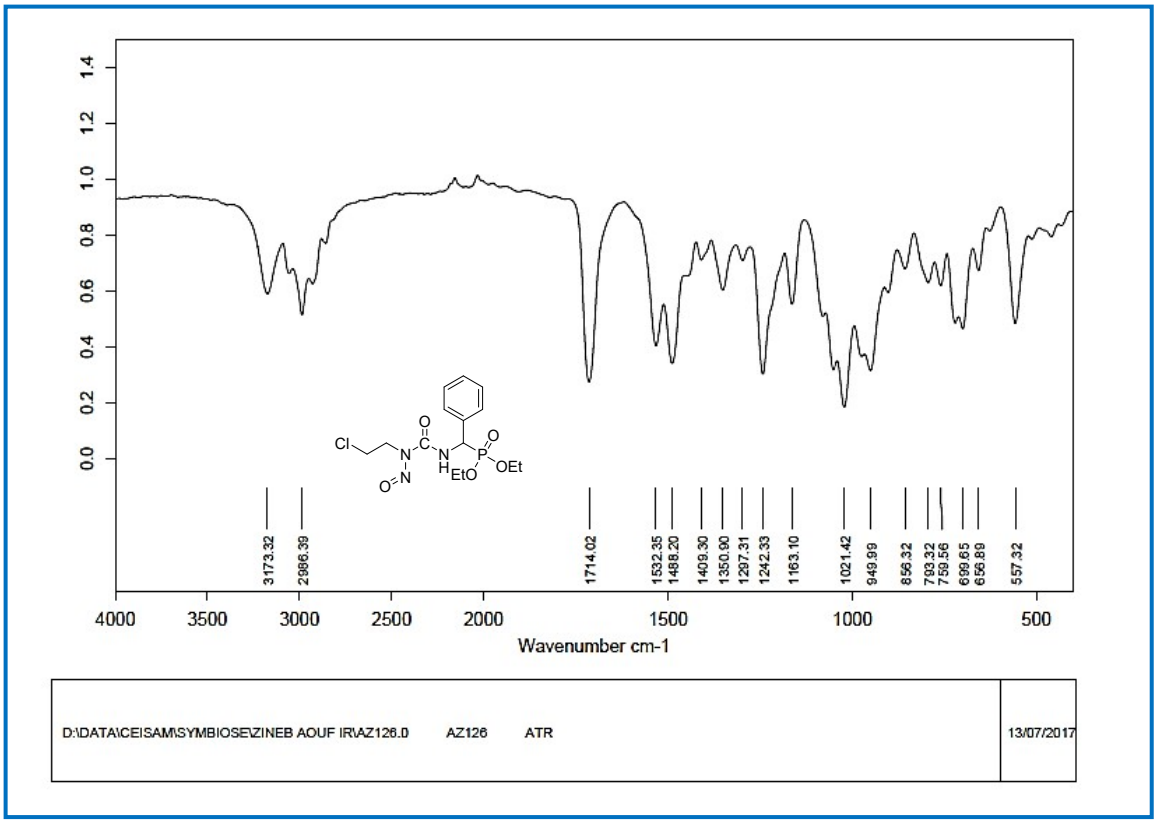
^{1}H NMR Spectrum: Diethyl ((3-(2-chloroethyl)-3-nitrosoureido)(phenyl)methyl)phosphonate **(21)**



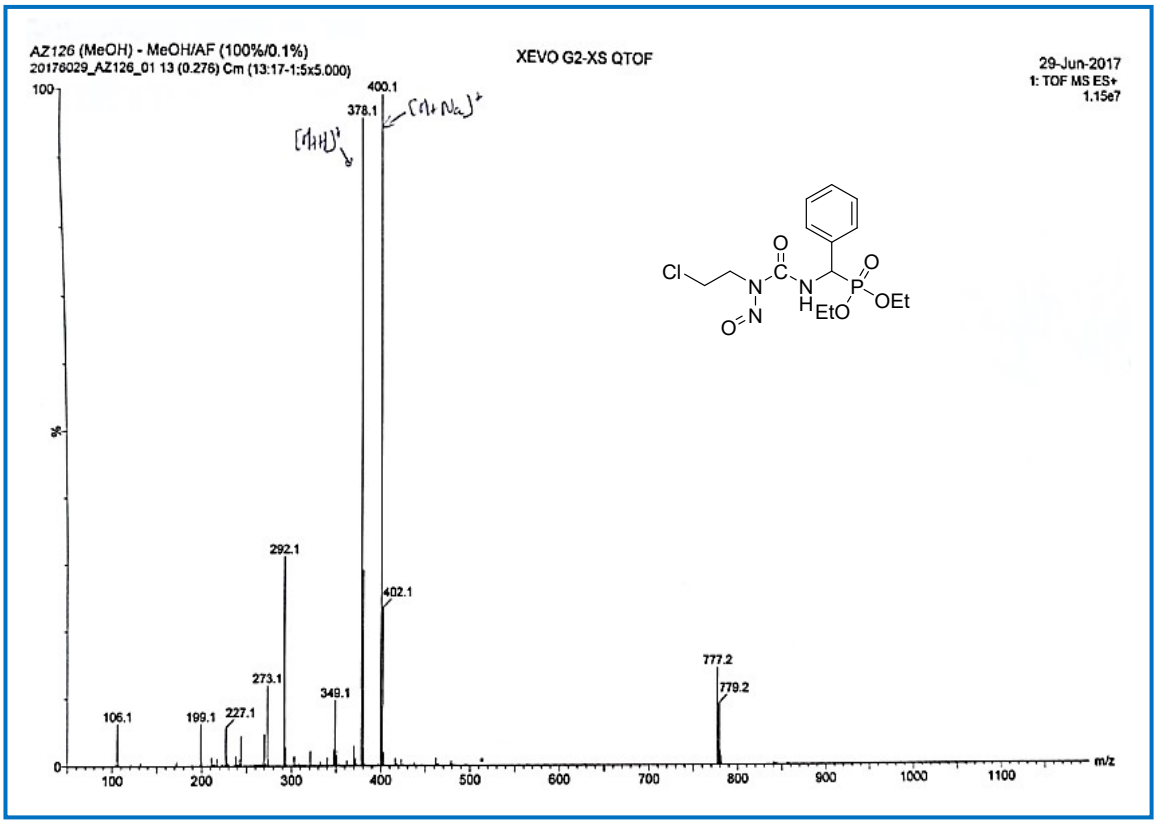
[13]C NMR Spectrum: Diethyl ((3-(2-chloroethyl)-3-nitrosoureido)(phenyl)methyl)phosphonate **(21)**



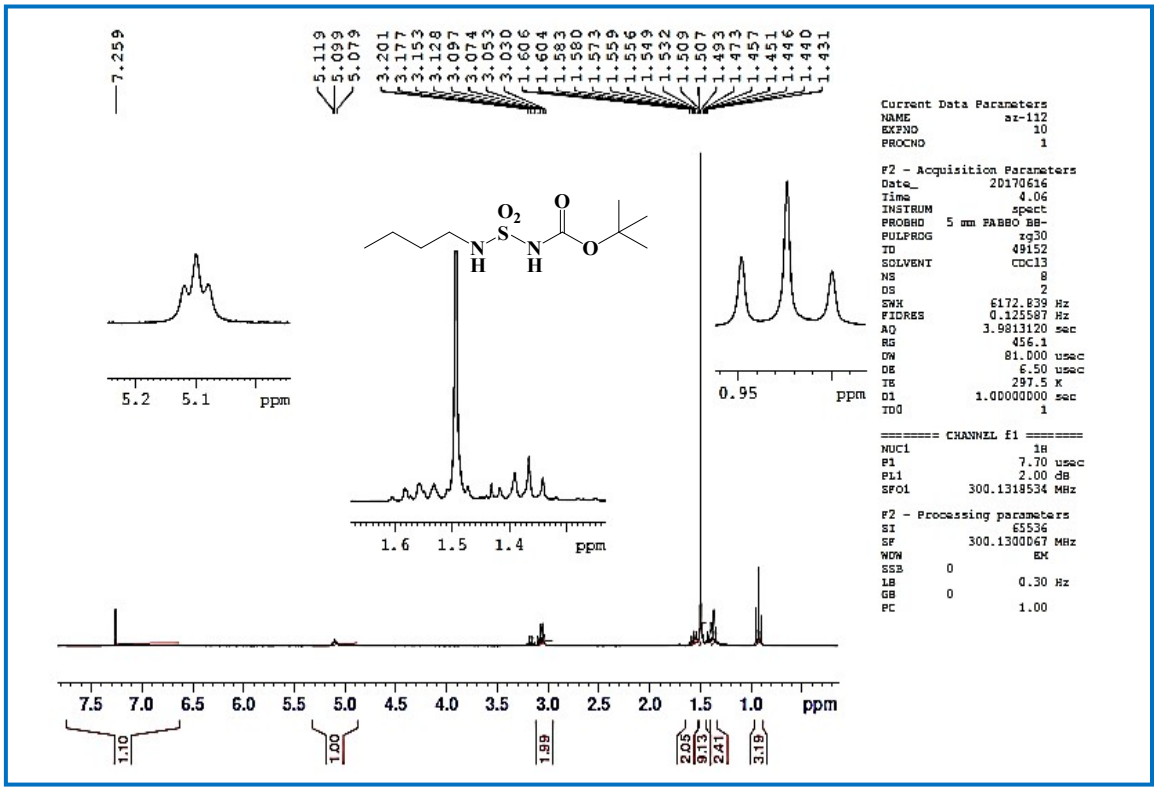
[31]P NMR Spectrum: Diethyl ((3-(2-chloroethyl)-3-nitrosoureido)(phenyl)methyl)phosphonate **(21)**



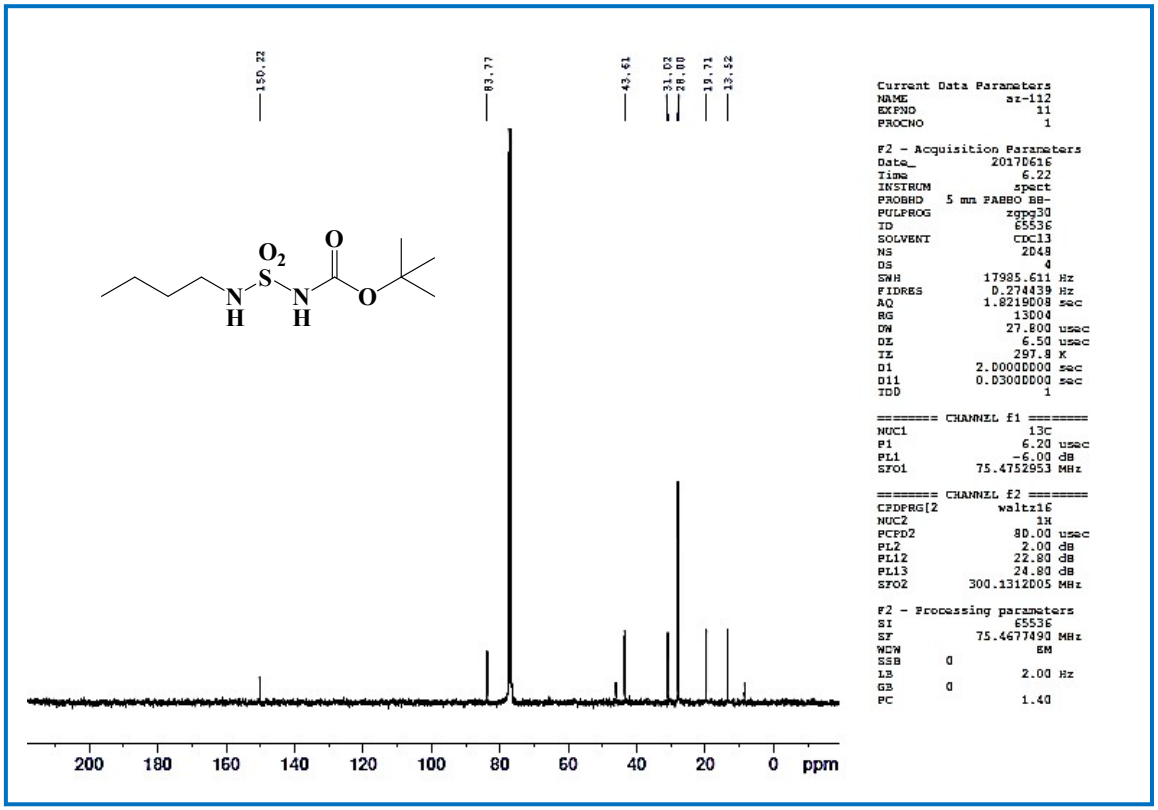
IR Spectrum: Diethyl ((3-(2-chloroethyl)-3-nitrosoureido)(phenyl)methyl)phosphonate **(21)**



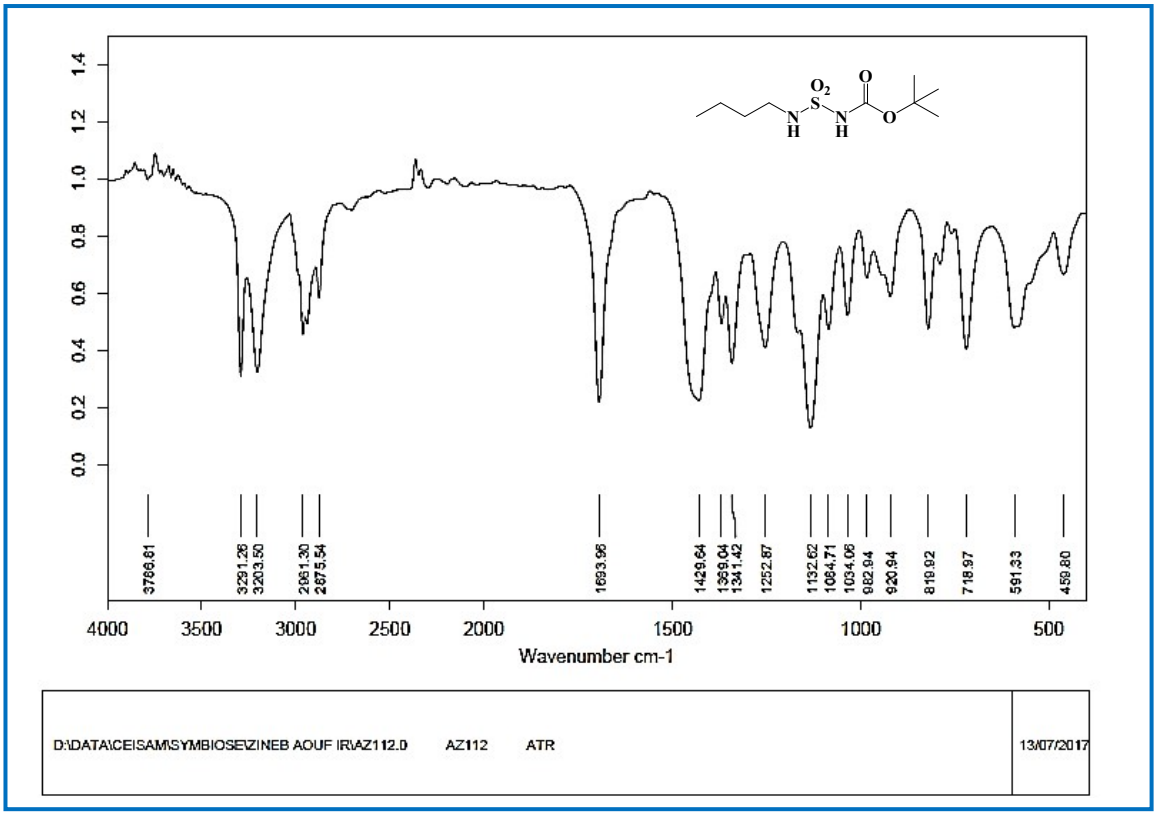
MS Spectrum: Diethyl ((3-(2-chloroethyl)-3-nitrosoureido)(phenyl)methyl)phosphonate **(21)**



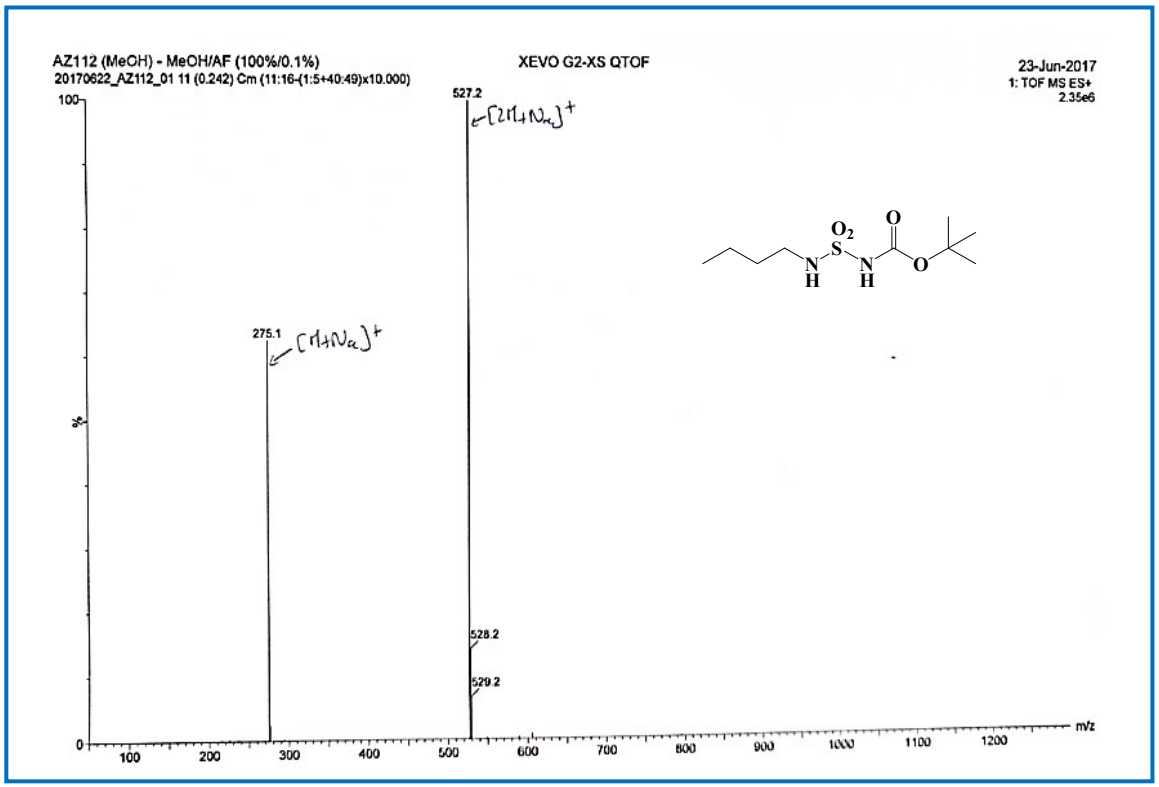
[1]H NMR Spectrum: *Tert*-butyl *N*-butylsulfamoylcarbamate **(22)**



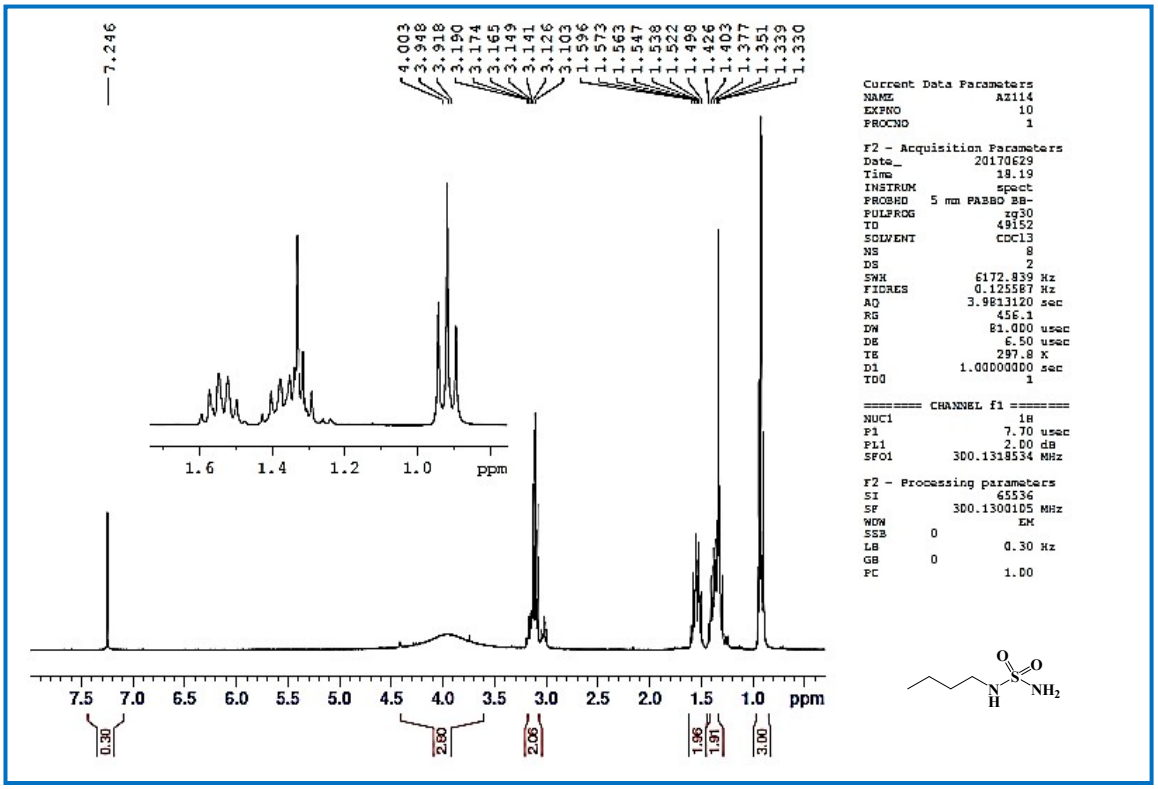
[13]C NMR Spectrum: *Tert*-butyl *N*-butylsulfamoylcarbamate **(22)**



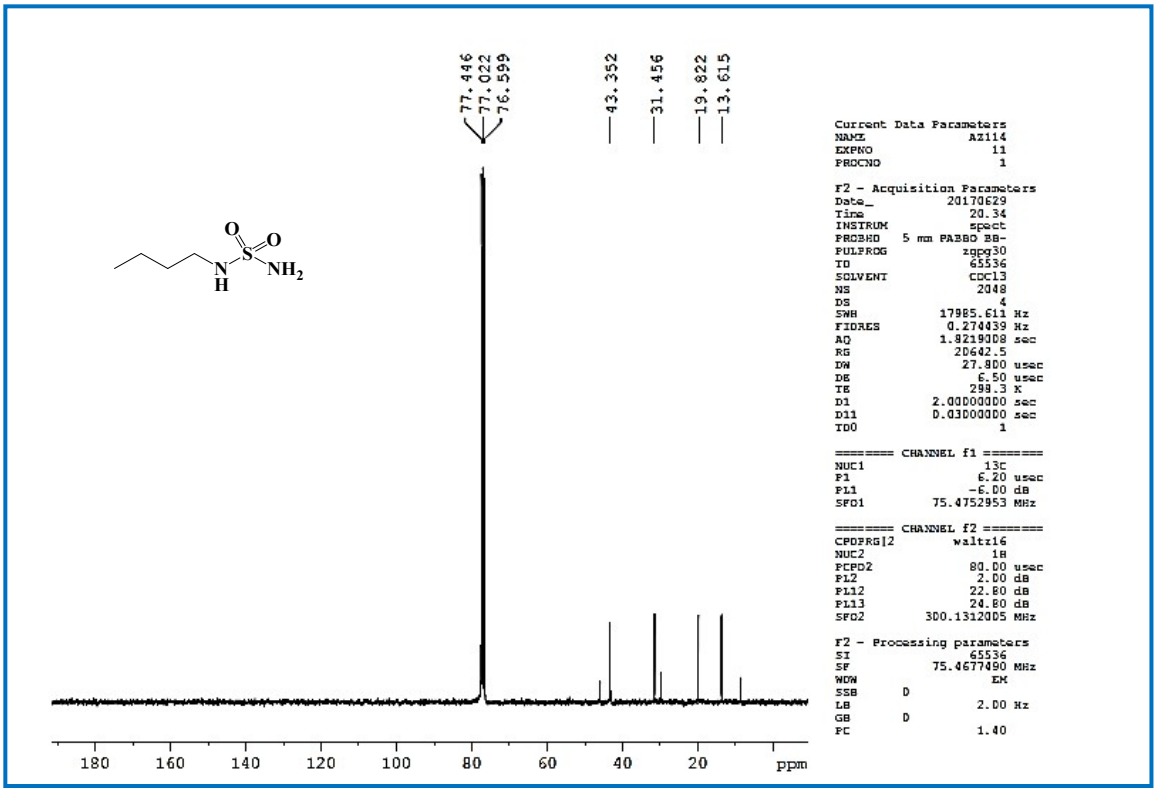
IR Spectrum: *Tert*-butyl *N*-butylsulfamoylcarbamate **(22)**



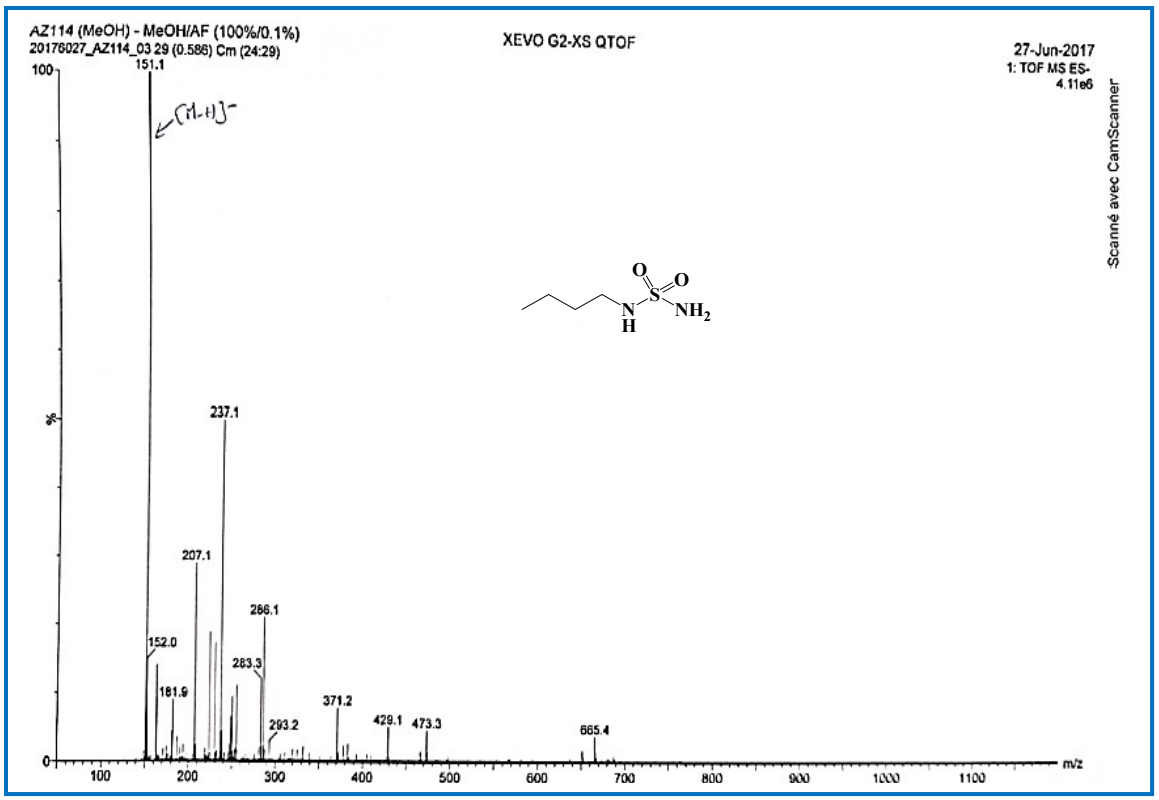
MS Spectrum: *Tert*-butyl *N*-butylsulfamoylcarbamate **(22)**



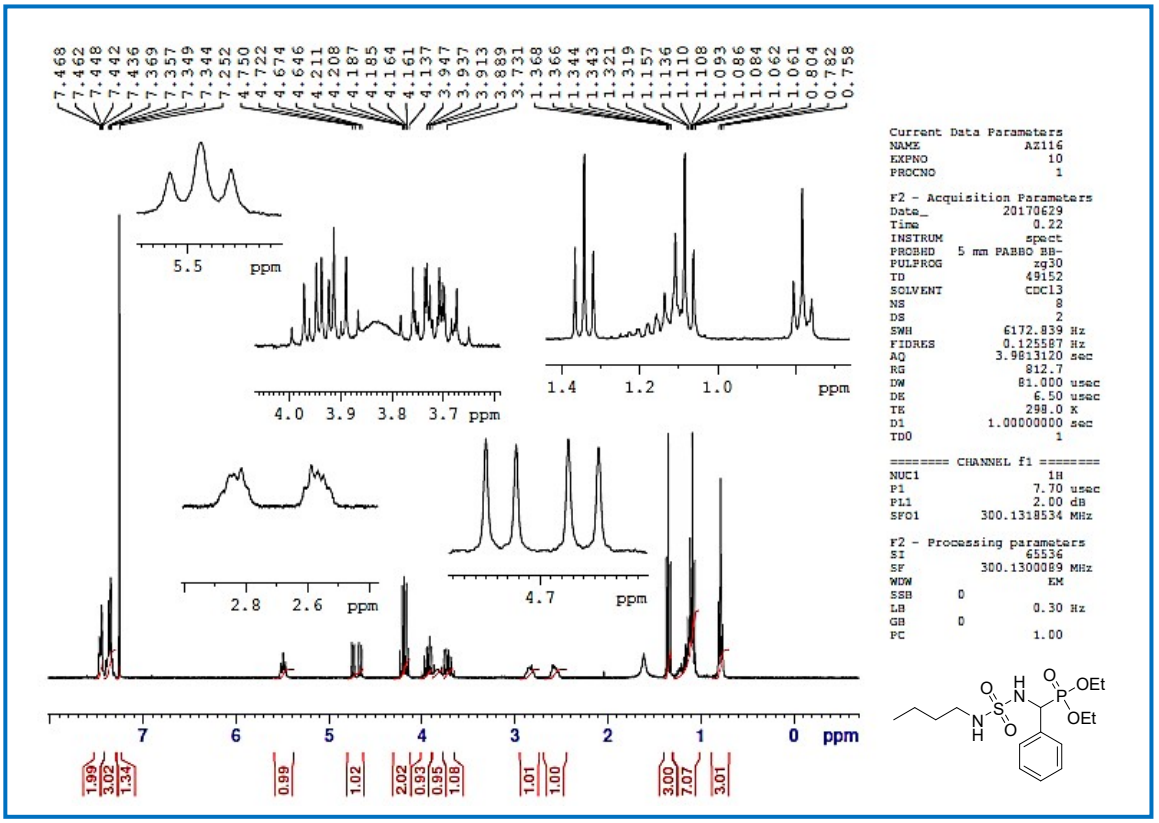
[1]H NMR Spectrum: *N*-butylsulfamide **(23)**



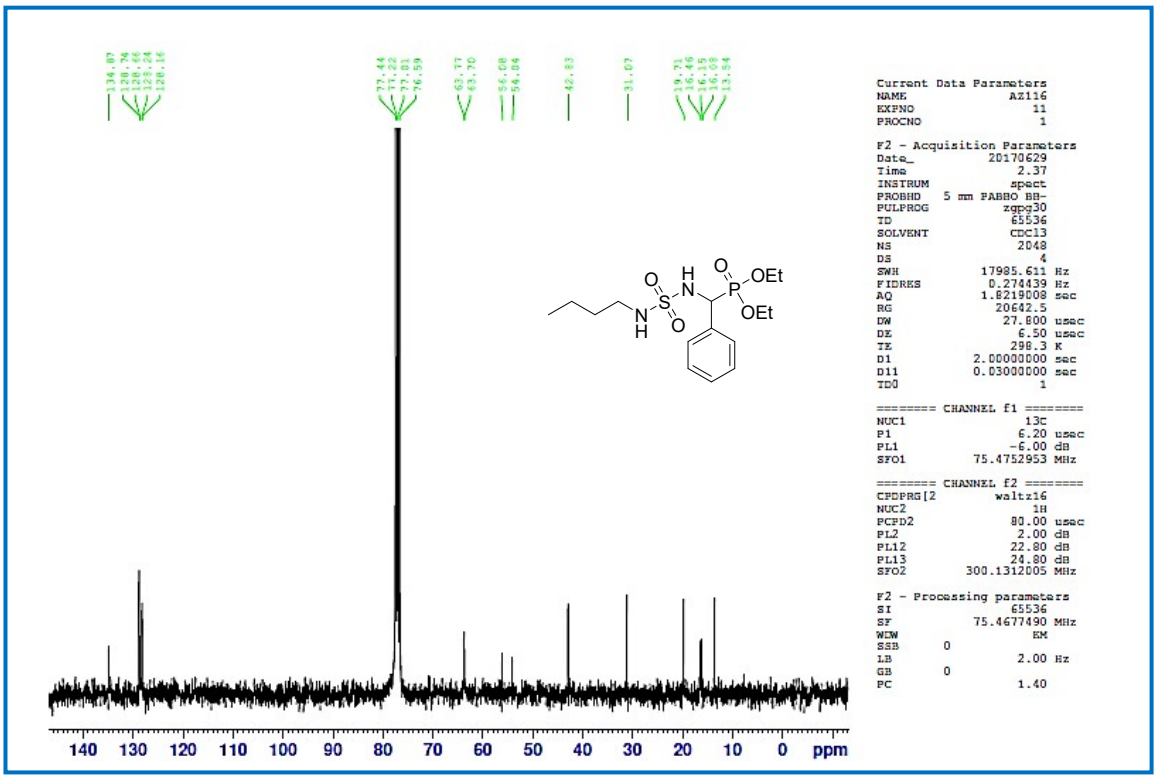
[13]C NMR Spectrum: *N*-butylsulfamide **(23)**



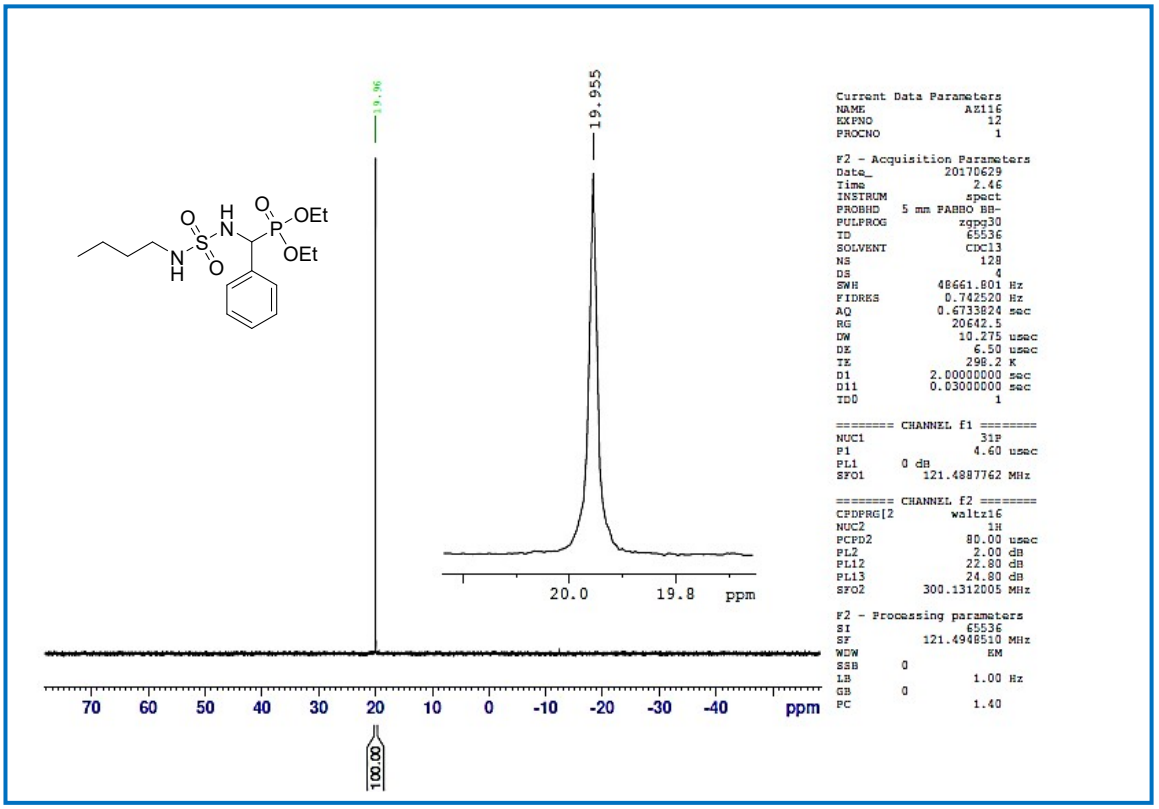
MS Spectrum: *N*-butylsulfamide **(23)**



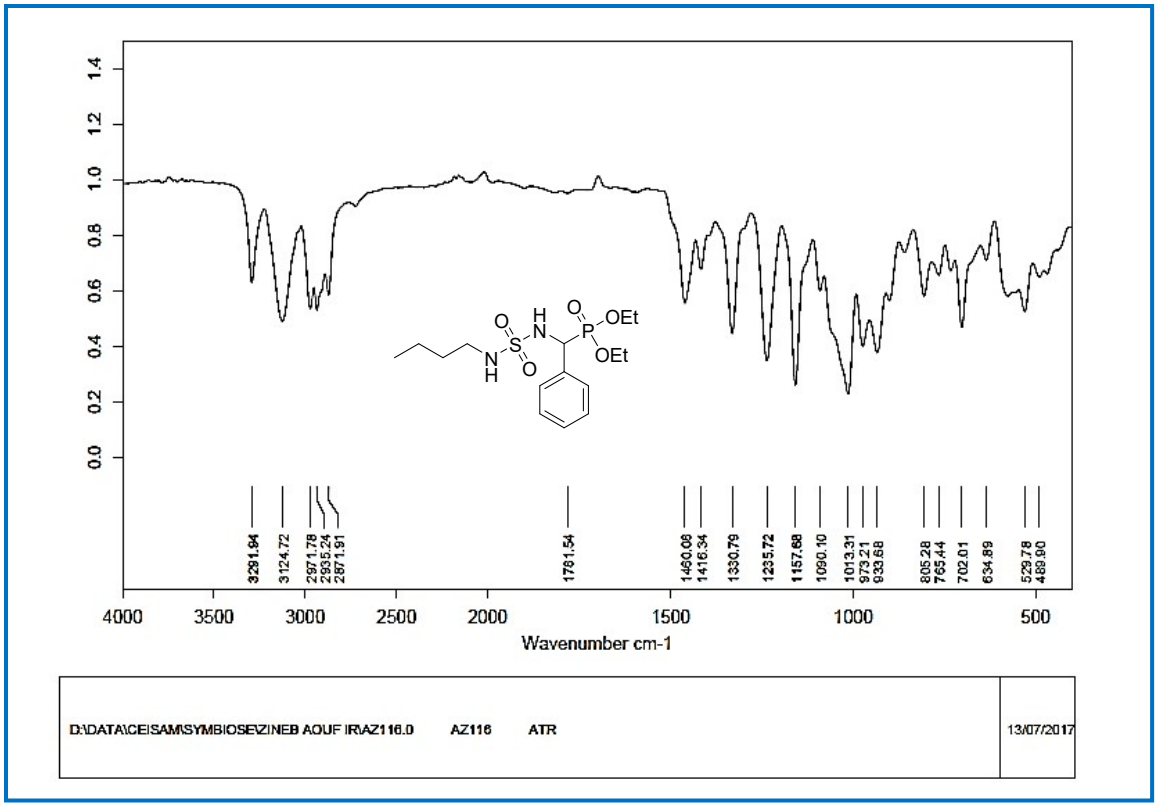
^{1}H NMR Spectrum: Diethyl (((*N*-butylsulfamoyl)amino)(phenyl)methyl)phosphonate **(24)**



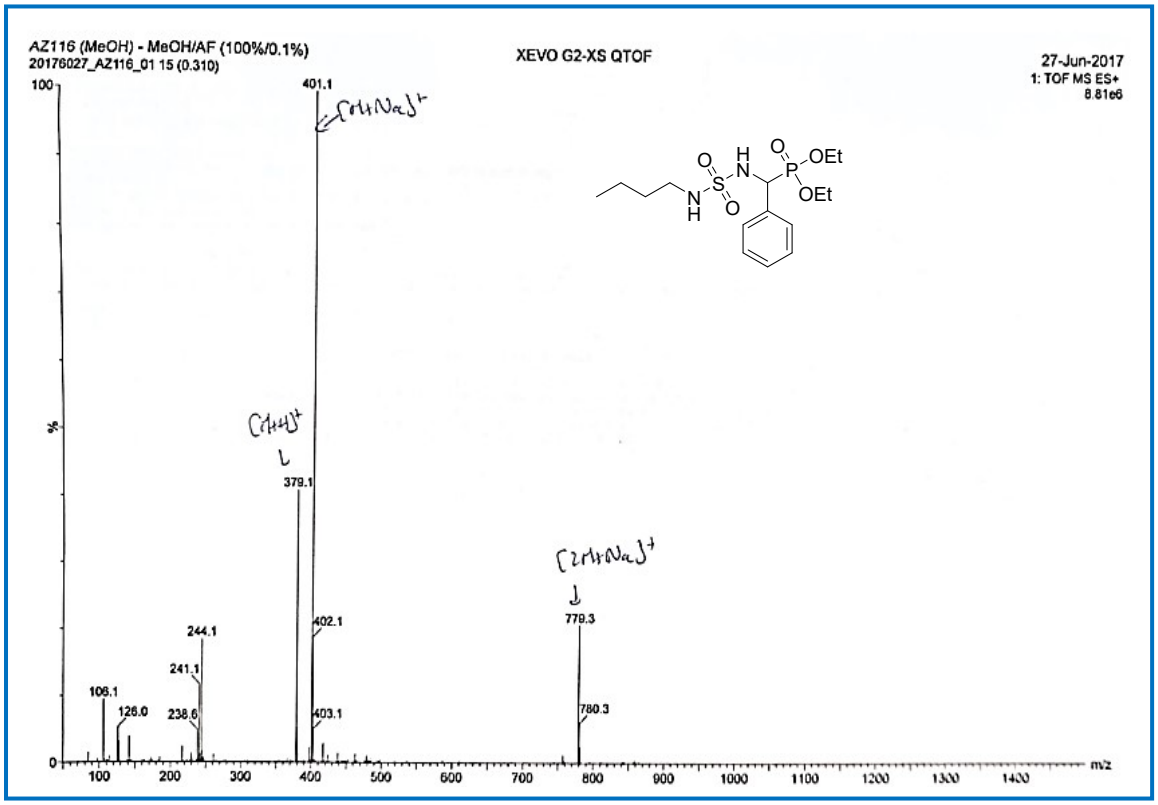
[13]C NMR Spectrum: Diethyl (((*N*-butylsulfamoyl)amino)(phenyl)methyl)phosphonate **(24)**



[31]P NMR Spectrum: Diethyl (((*N*-butylsulfamoyl)amino)(phenyl)methyl)phosphonate **(24)**



IR Spectrum: Diethyl (((*N*-butylsulfamoyl)amino)(phenyl)methyl)phosphonate **(24)**



MS Spectrum: Diethyl (((*N*-butylsulfamoyl)amino)(phenyl)methyl)phosphonate **(24)**