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Betaine mediated enhancement of thermal stability and acidity tolerance of vanadium(V) solutions

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Supporting Information

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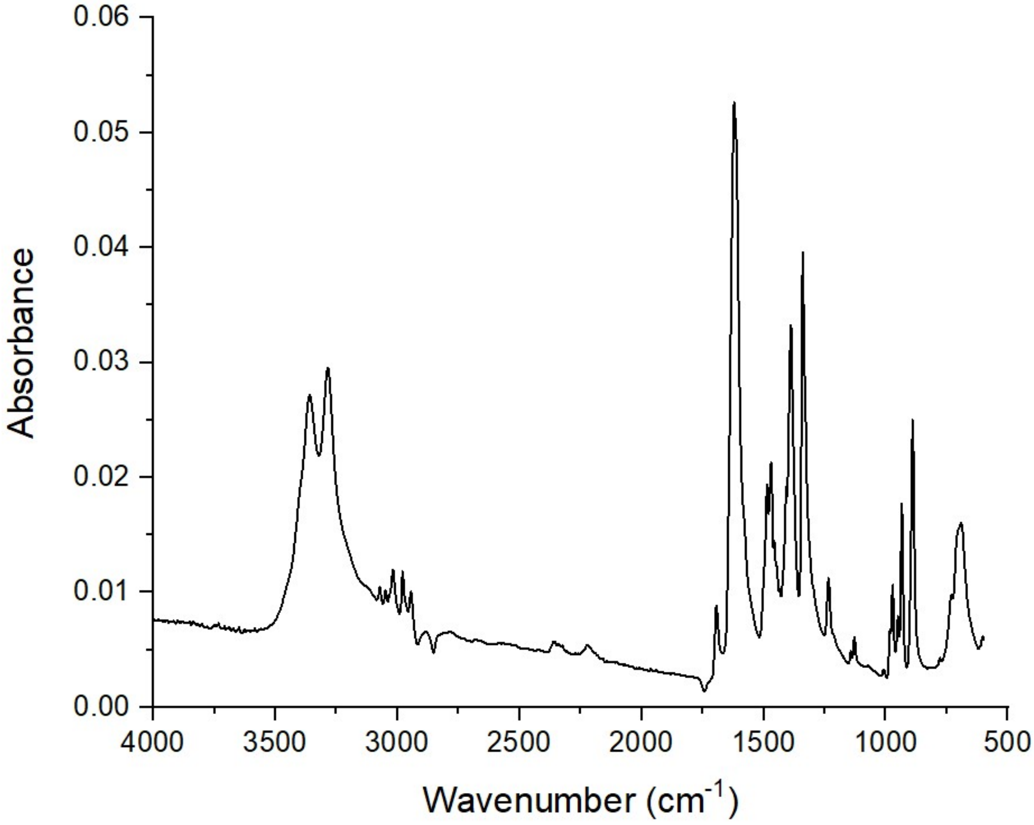

Figure S1. ATR-FTIR spectrum of betaine.

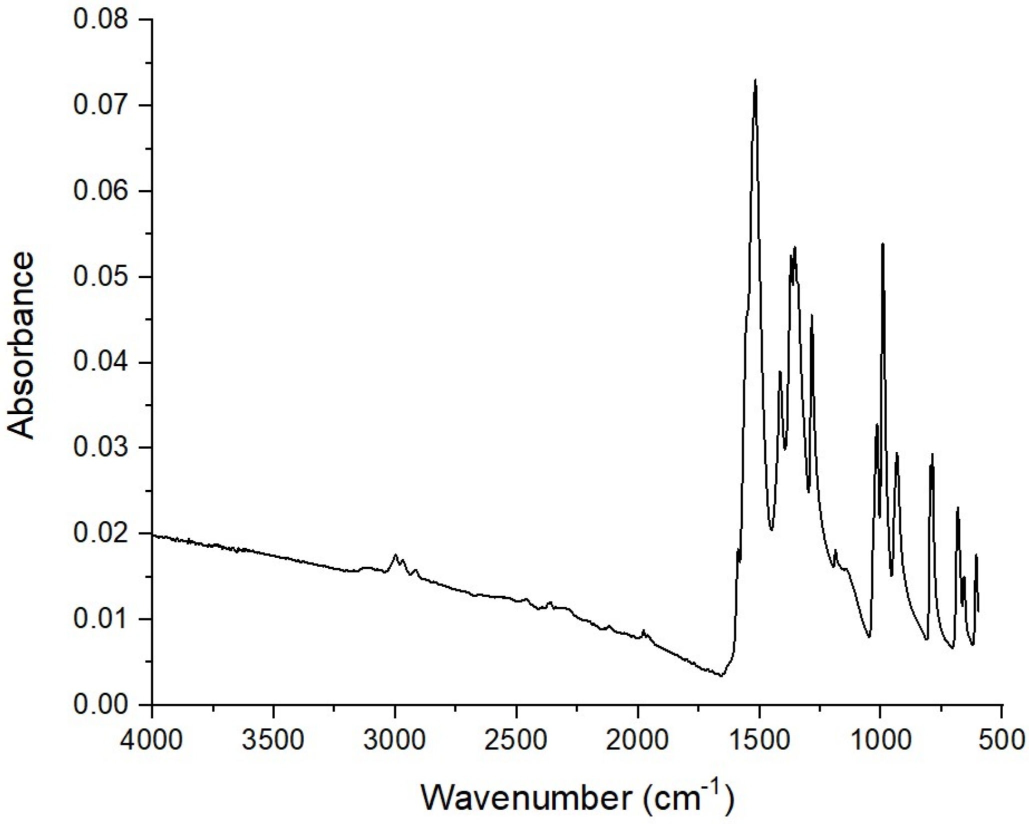

Figure S2. ATR-FTIR spectrum of $VO(acac)_2$.

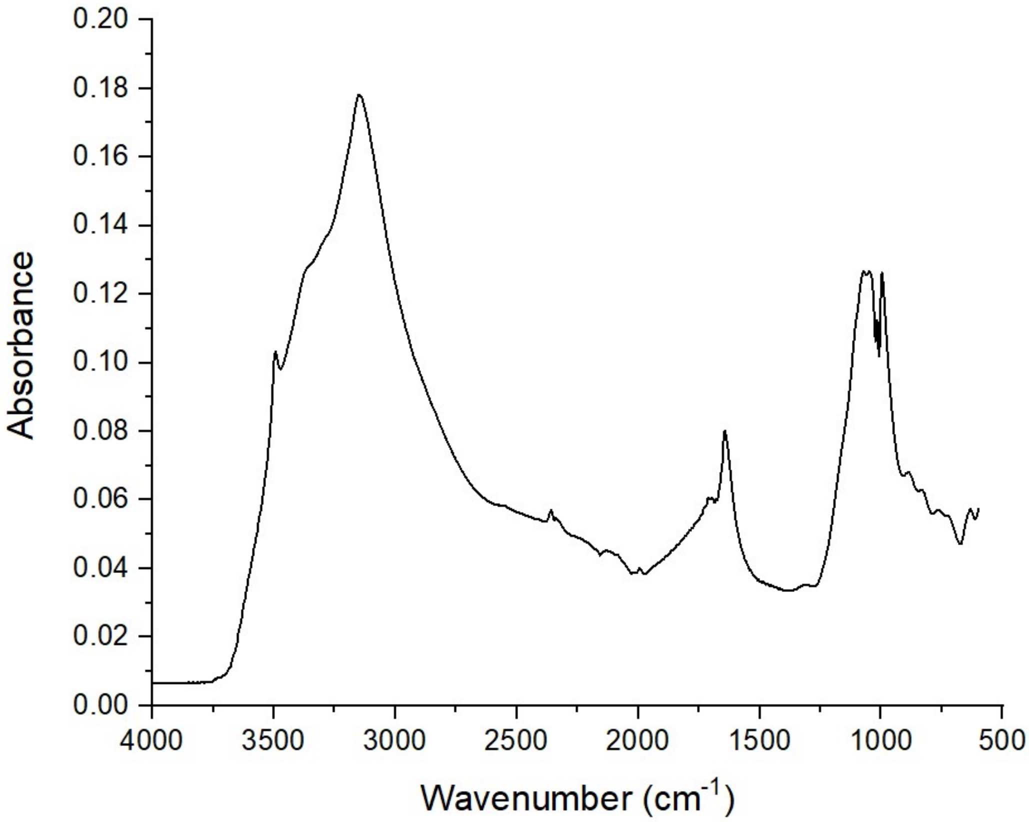

Figure S3. ATR-FTIR spectrum of hydrated $VO(SO)_4$.

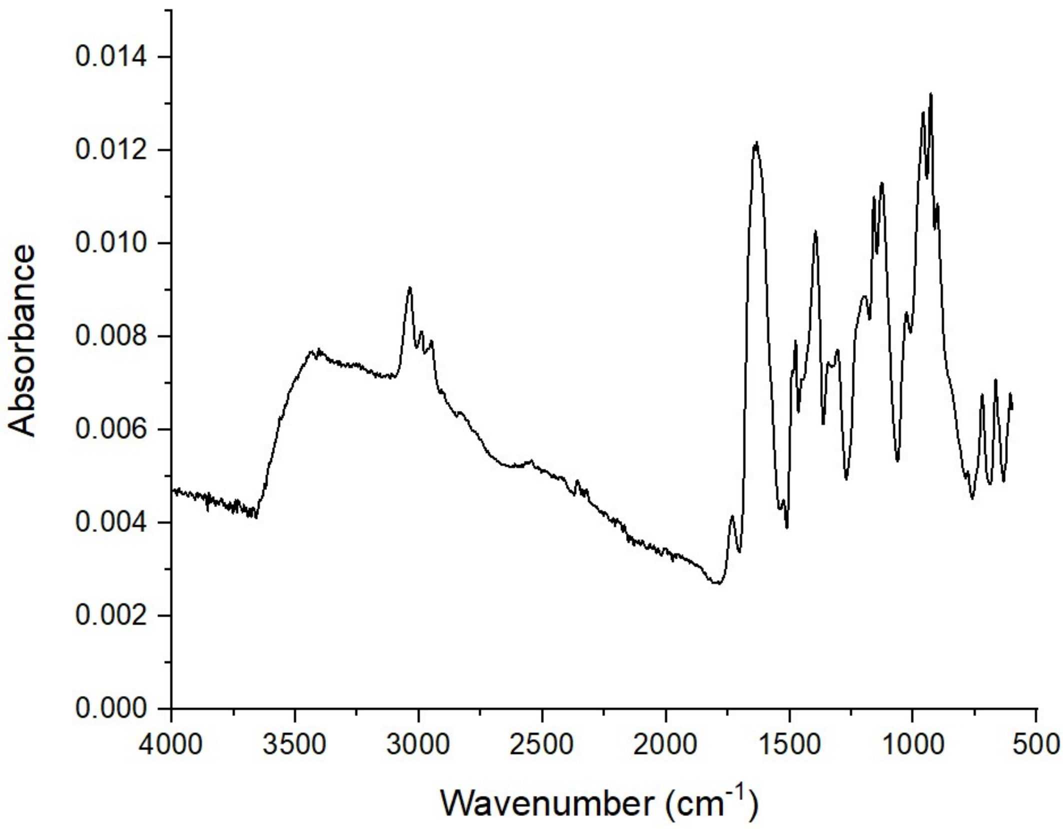

Figure S4. ATR-FTIR spectrum of $VO(Bet)_2SO_4$ prepared according to method A.

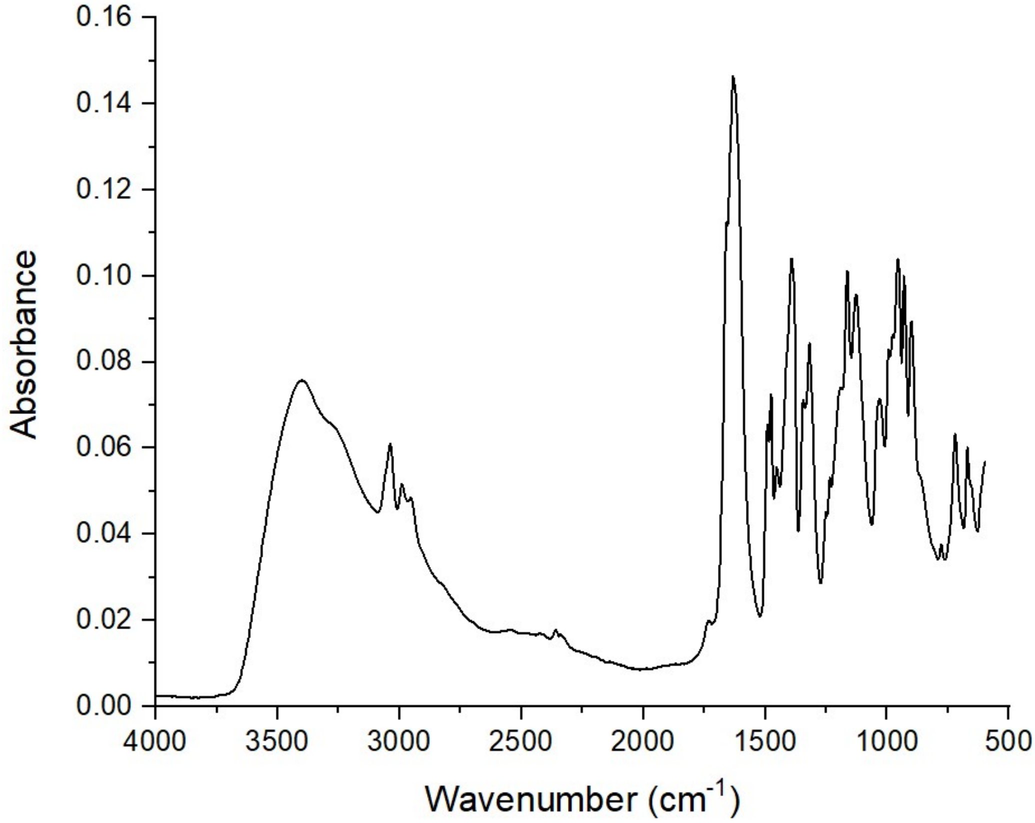

Figure S5. ATR-FTIR spectrum of $VO(Bet)_2SO_4$ prepared according to method B.

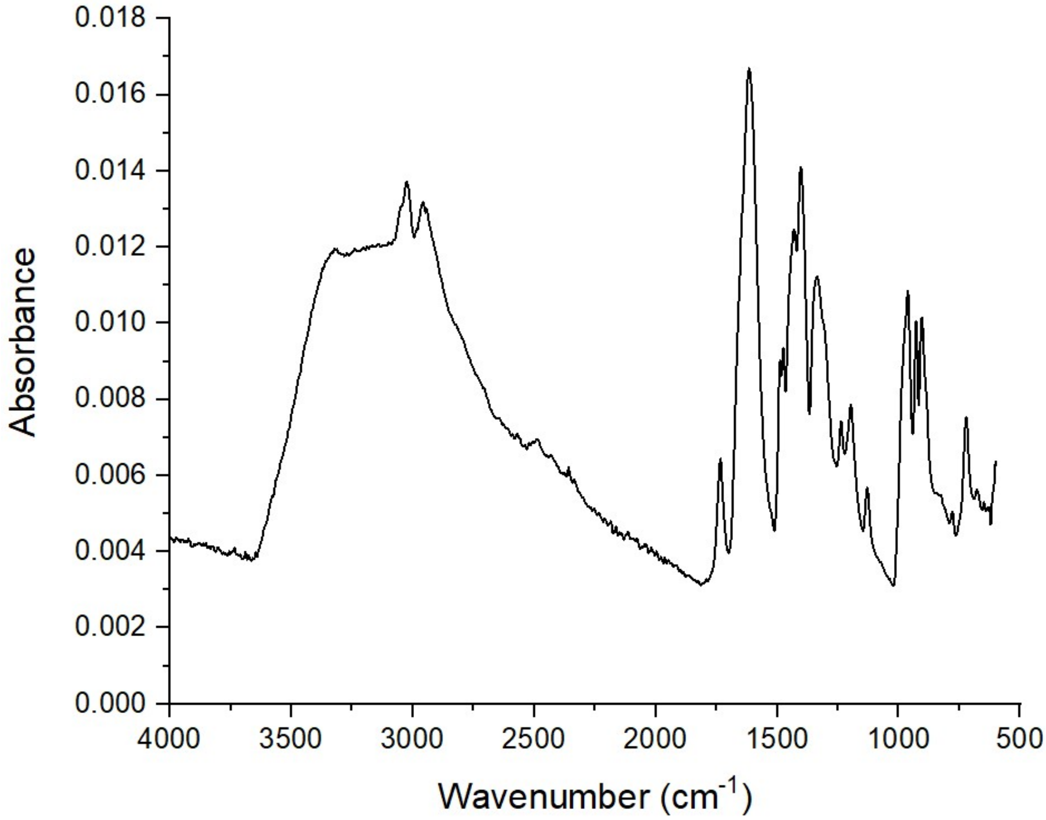

Figure S6. ATR-FTIR spectrum of $VO(Bet)_2(Cl)_2$ prepared according to method A.

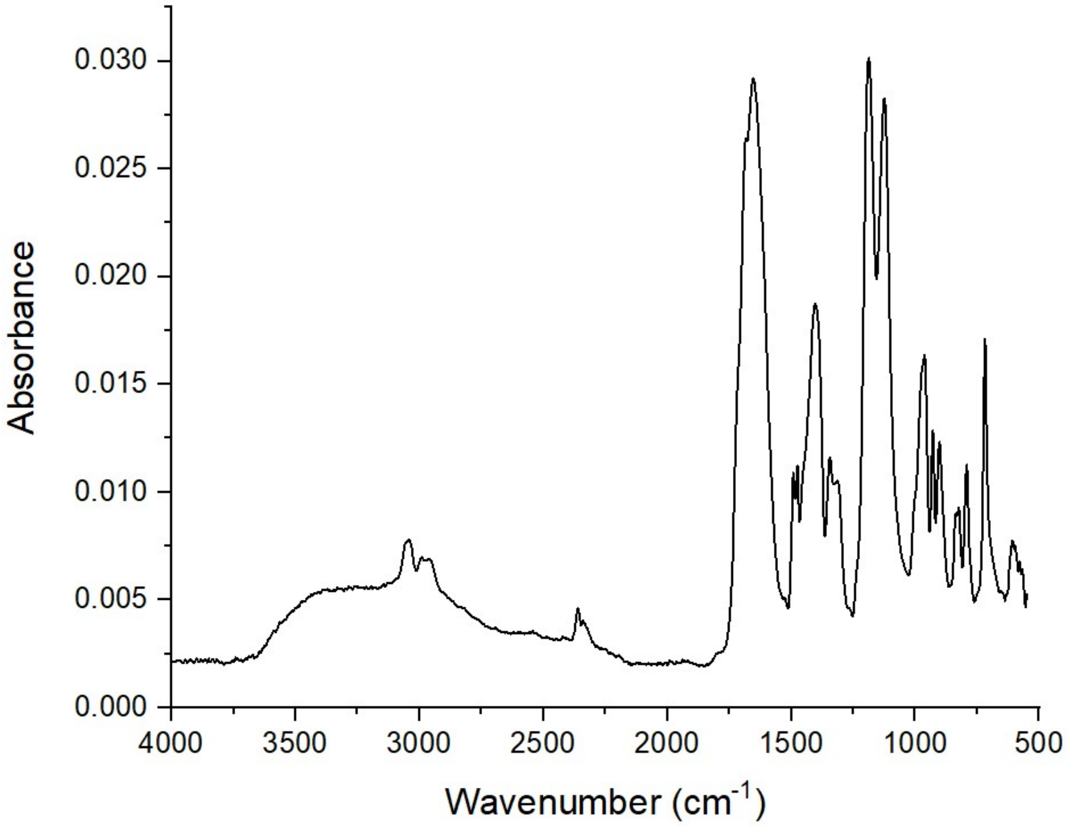

Figure S7. ATR-FTIR spectrum of $VO(Bet)_2(TFA)_2$ prepared according to method A.

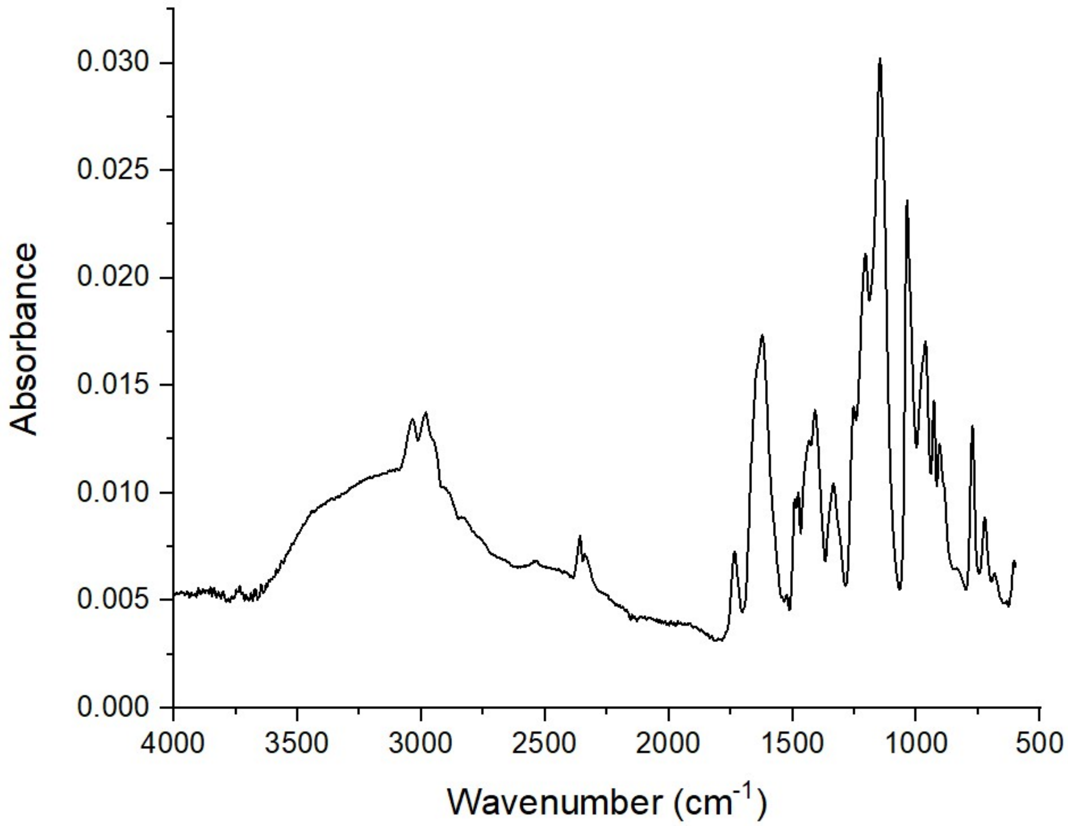

Figure S8. ATR-FTIR spectrum of $VO(Bet)_2(MsO)_2$ prepared according to method A.

Compound		C (%)	H (%)	N (%)	S (%)
$[VO(Bet)_2]SO_4$ method A	Test1	25.76	6.933	5.79	6.299
	Test2	25.66	6.607	6.95	6.425
	Mean Value	25.71	6.770	5.87	6.362
	Deviation (abs.)	0.07	0.231	0.11	0.090
$[VO(Bet)_2]SO_4$ method B	Test1	25.98	6.483	5.84	6.562
	Test2	25.67	6.601	5.97	6.606
	Mean Value	25.83	6.542	5.91	6.584
	Deviation (abs.)	0.21	0.084	0.09	0.031
$[VO(Bet)_2](Cl)_2$	Test1	27.79	6.870	6.35	
	Test2	27.82	6.877	6.34	
	Mean Value	27.81	6.873	6.35	
	Deviation (abs.)	0.02	0.005	0.01	
$[VO(Bet)_2](TFA)_2$	Test1	30.28	5.325	5.00	
	Test2	30.24	5.021	5.04	
	Mean Value	30.26	5.173	5.02	
	Deviation (abs.)	0.03	0.215	0.03	
$[VO(Bet)_2](MsO)_2$	Test1	27.79	6.751	5.26	11.894
	Test2	27.32	6.619	5.12	11.762
	Mean Value	27.55	6.685	5.19	11.828
	Deviation (abs.)	0.32	0.094	0.10	0.093

Table S1. Elemental analyses results of $[VO(Bet)_2]^{2+}$ compounds.

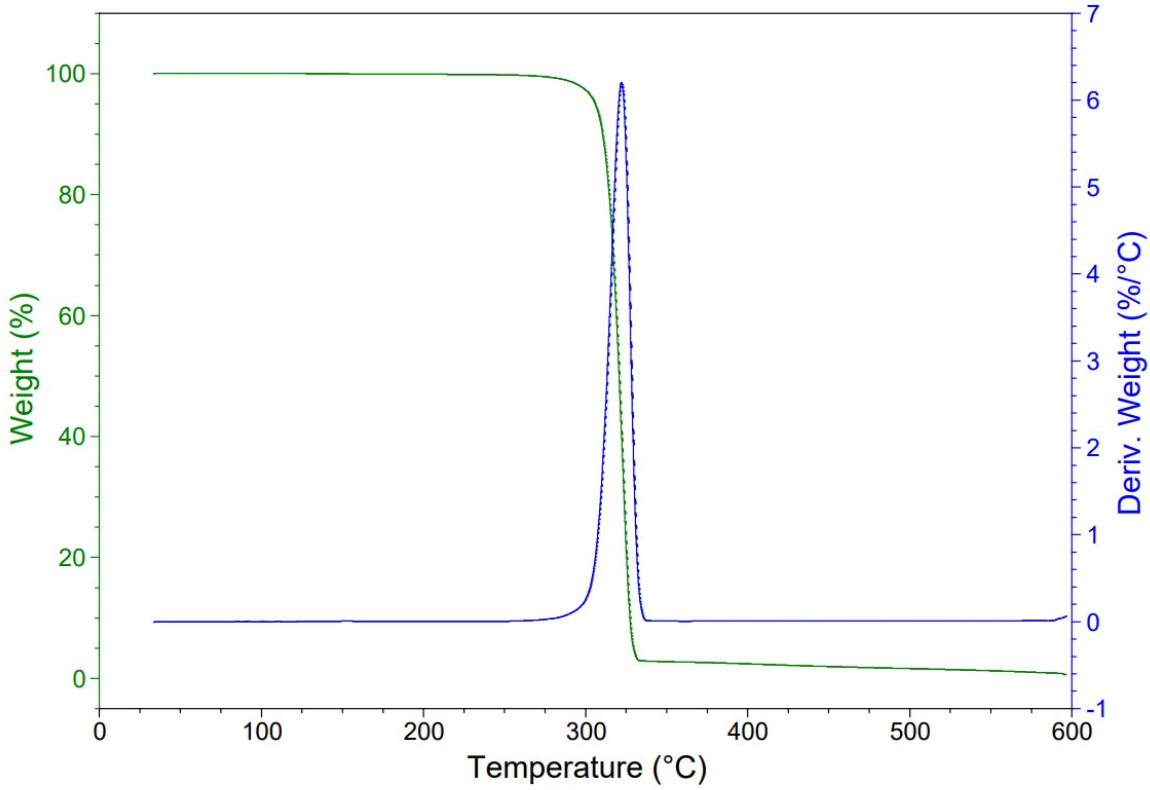

Figure S9. Thermal gravimetric analysis and derivative of betaine.

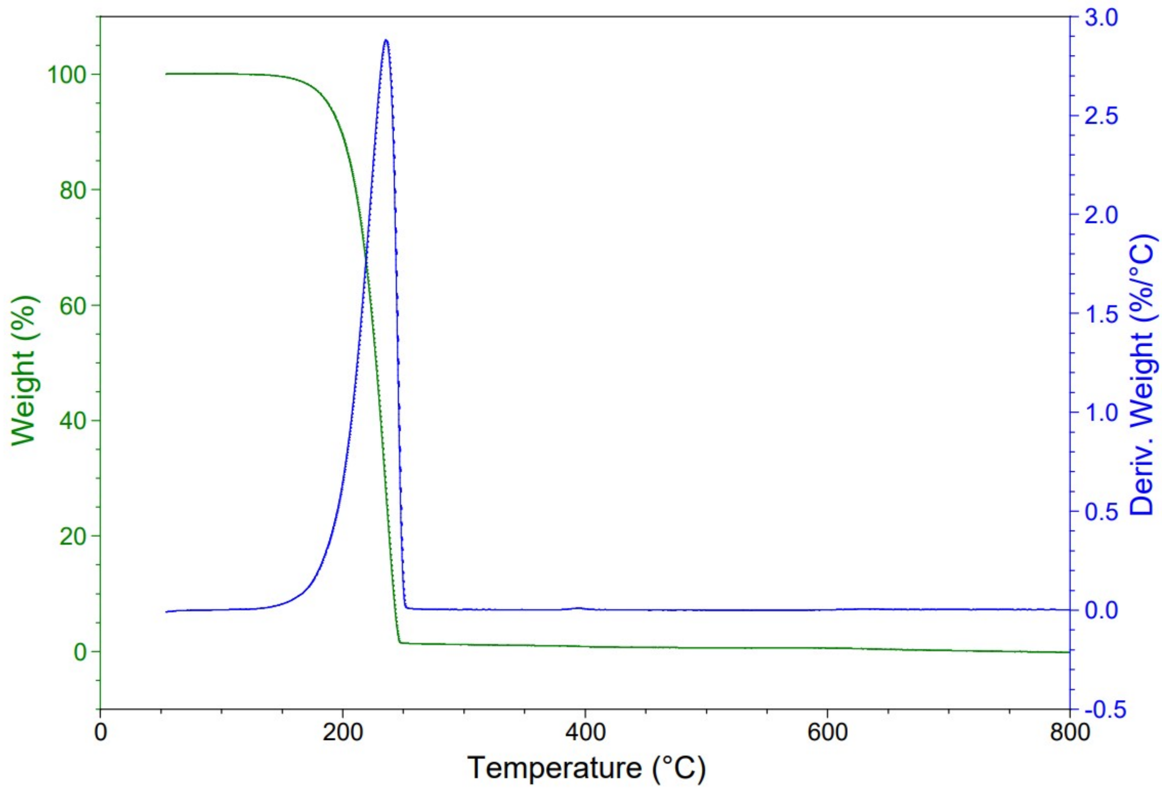

Figure S10. Thermal gravimetric analysis and derivative of $VO(acac)_2$.

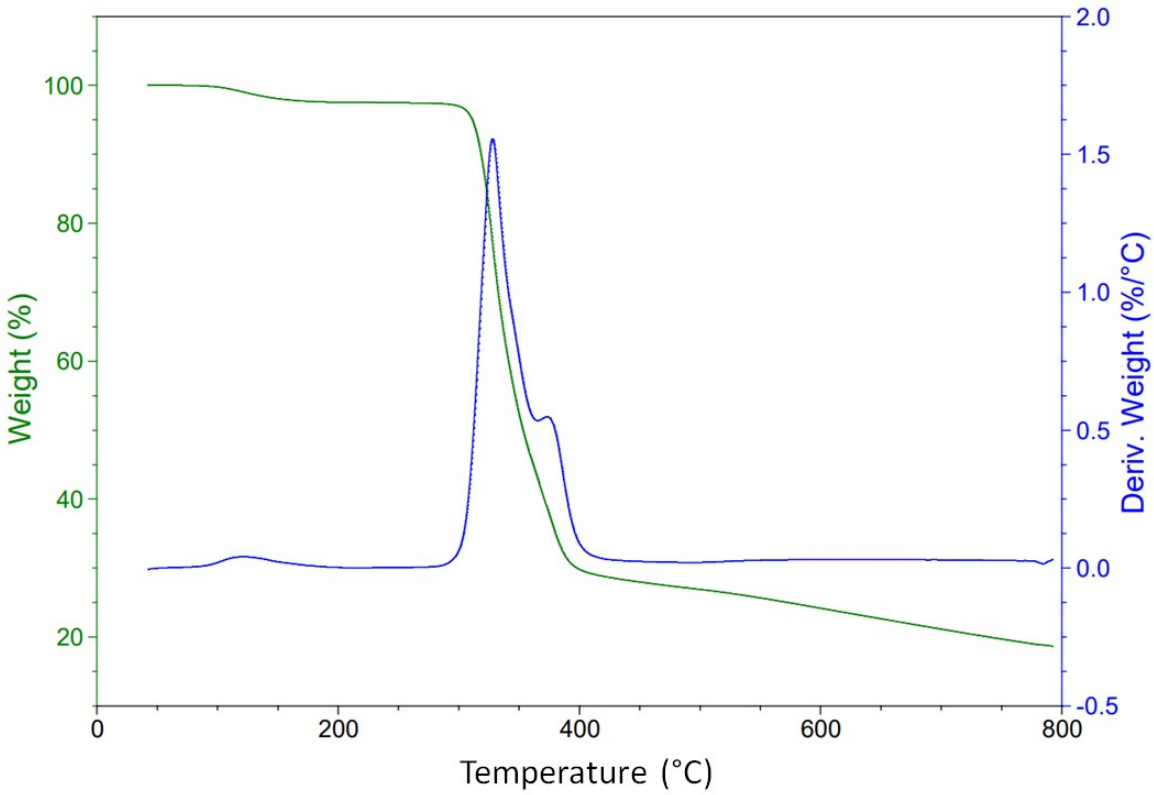

Figure S11. Thermal gravimetric analysis and derivative of $VO(Bet)_2SO_4$ prepared according to method A.

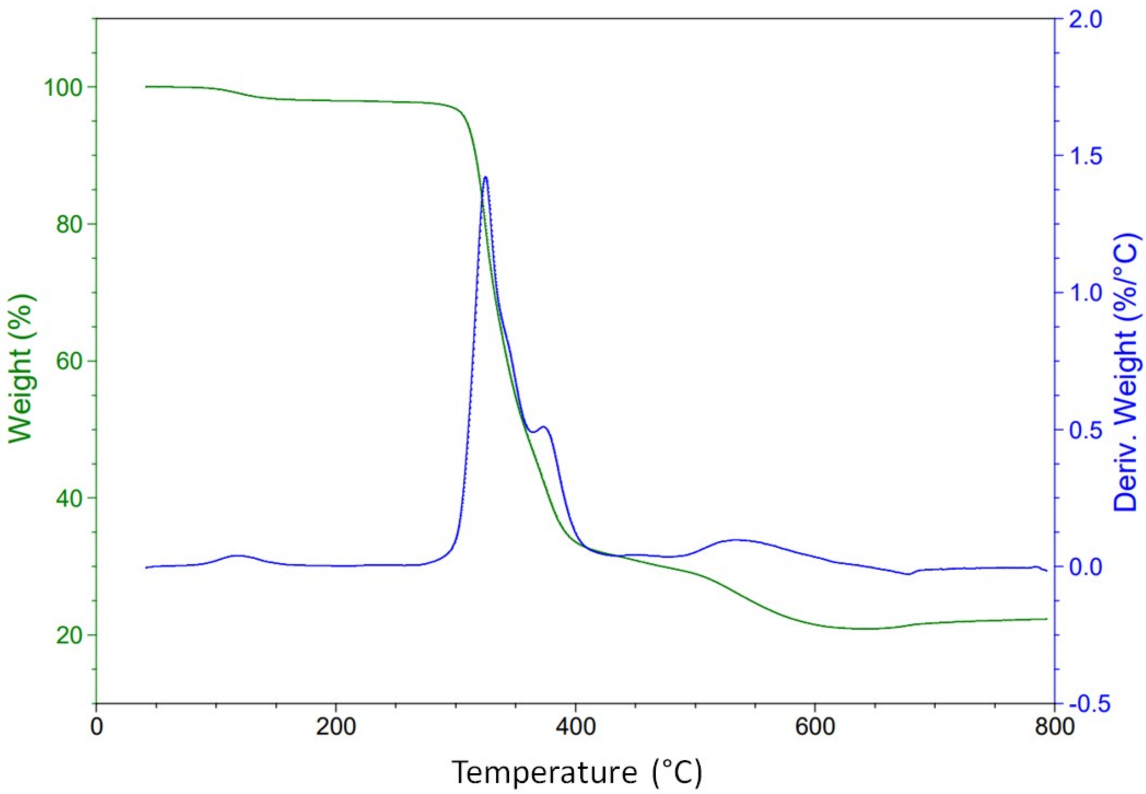

Figure S12. Thermal gravimetric analysis and derivative of $VO(Bet)_2SO_4$ prepared according to method B.

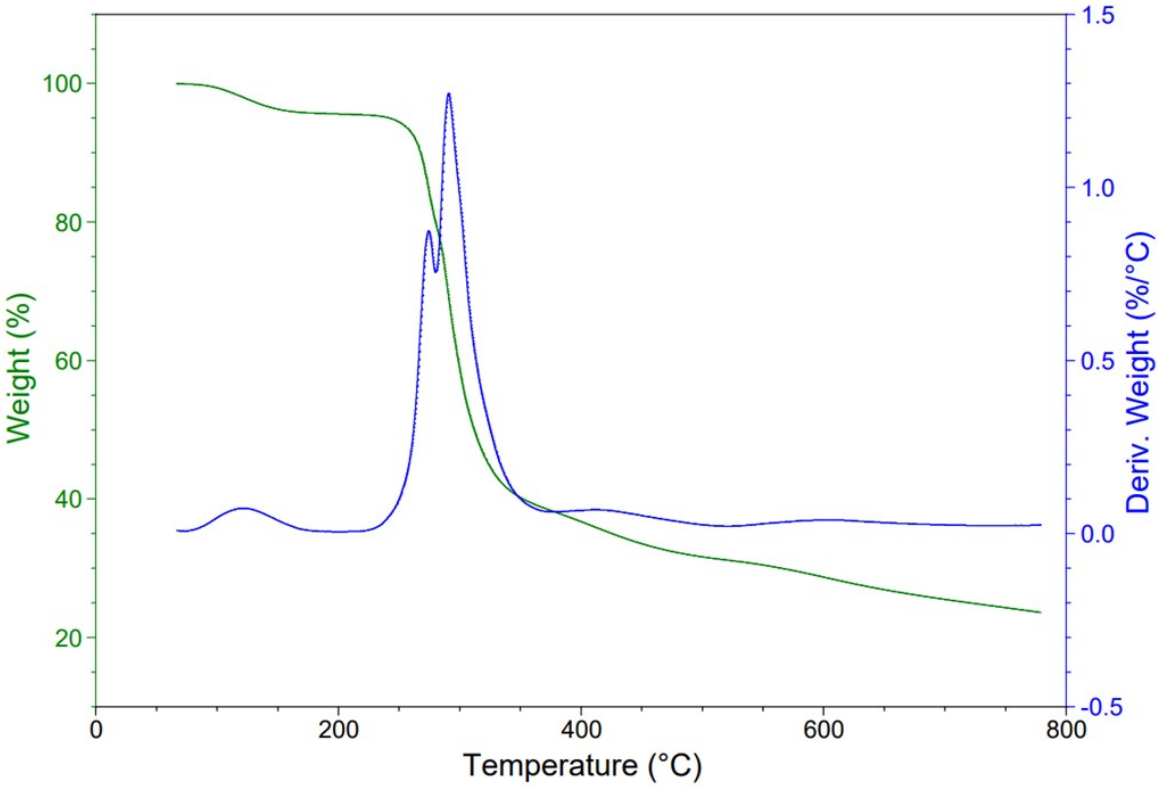

Figure S13. Thermal gravimetric analysis and derivative of $VO(Bet)_2(Cl)_2$.

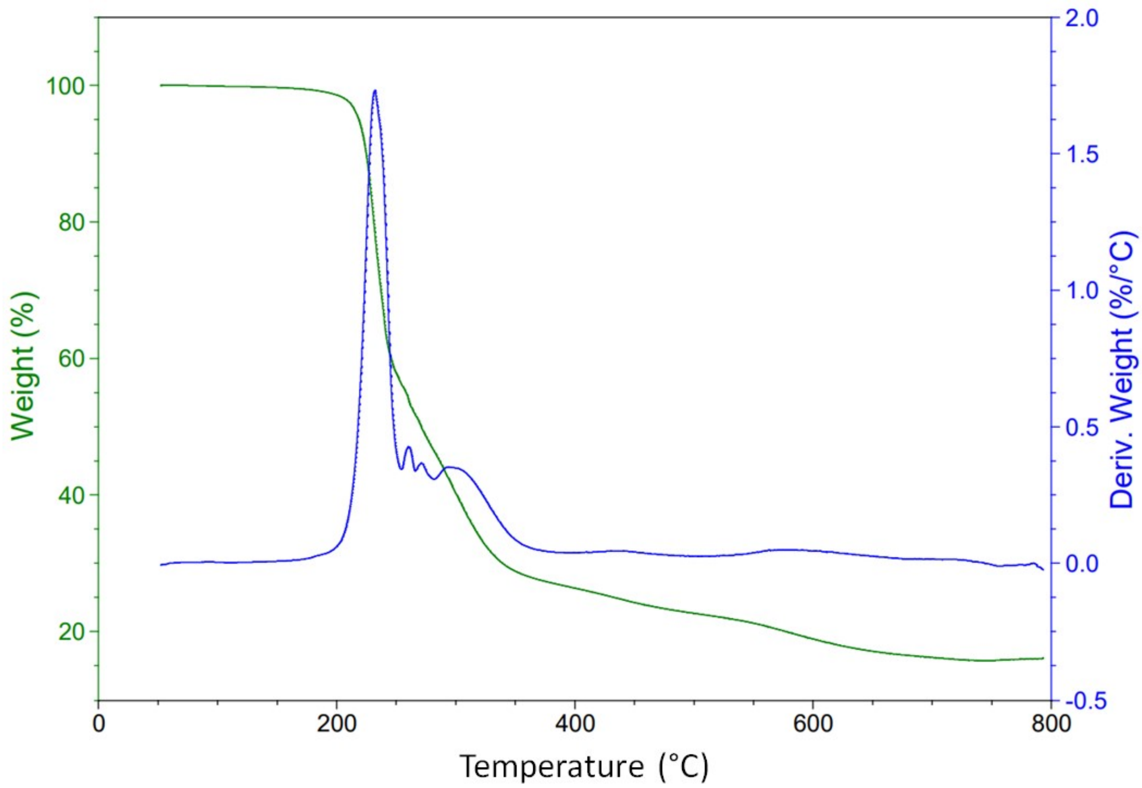

Figure S14. Thermal gravimetric analysis and derivative of $VO(Bet)_2(TFA)_2$.

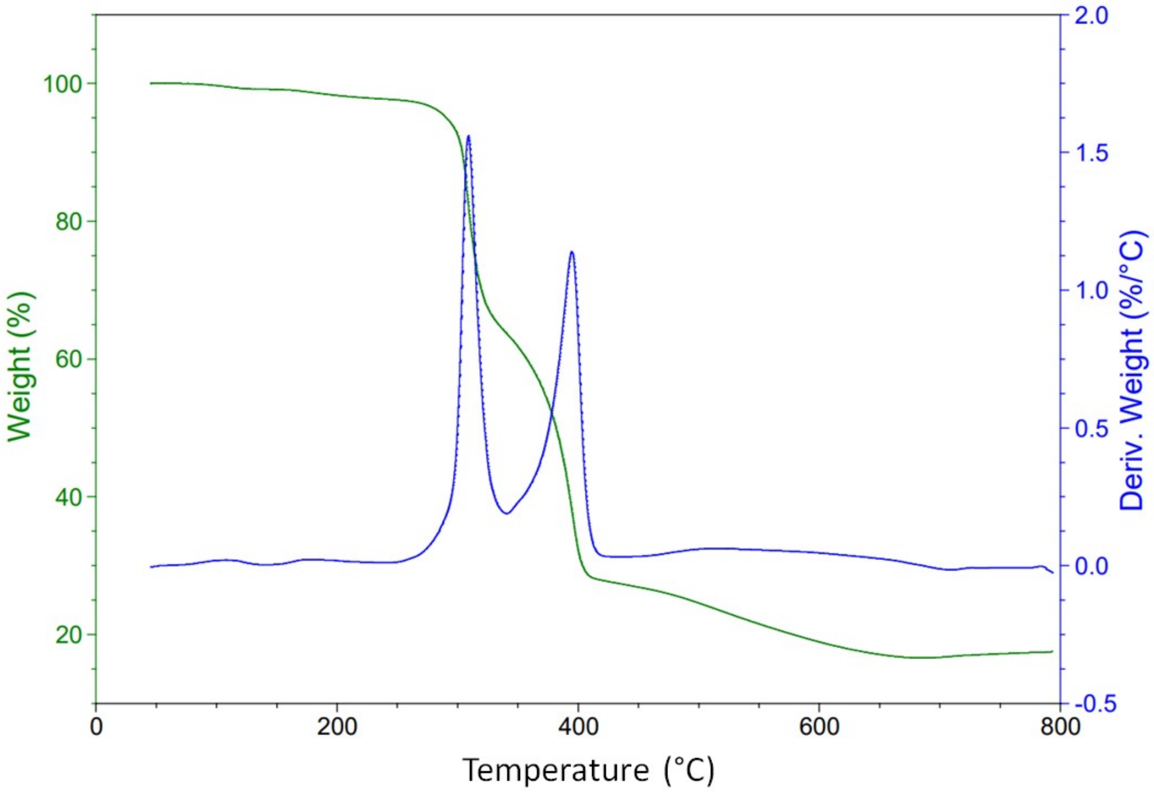

Figure S15. Thermal gravimetric analysis and derivative of $VO(Bet)_2(MsO)_2$.

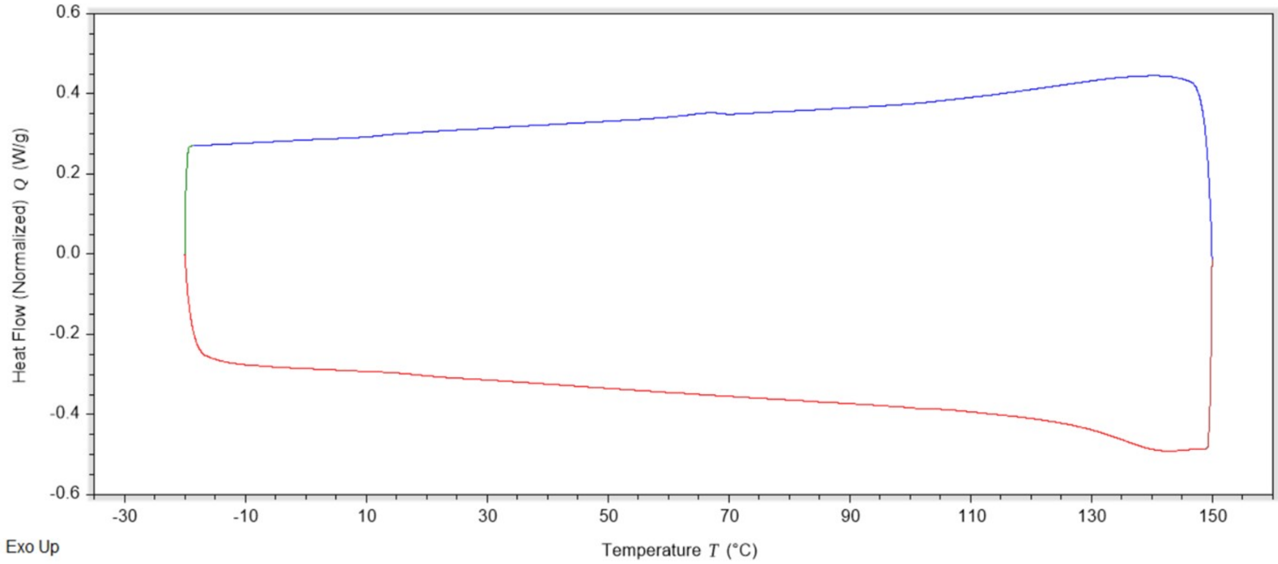

Figure S16. DSC analysis of $VO(Bet)_2SO_4$.

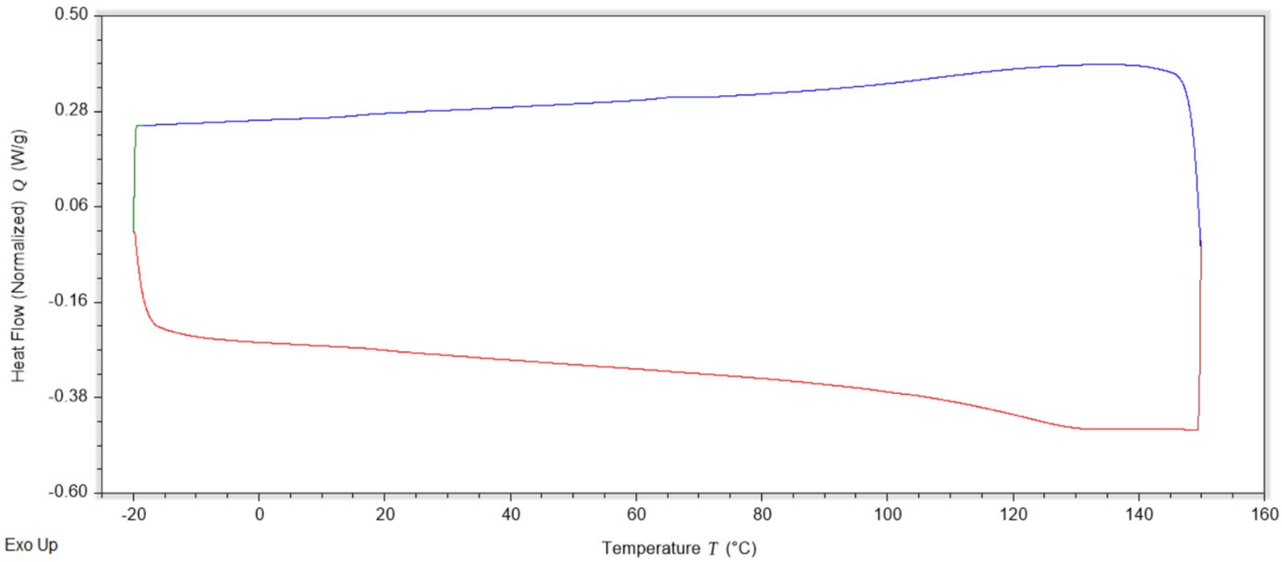

Figure S17. DSC analysis of $VO(Bet)_2(Cl)_2$.

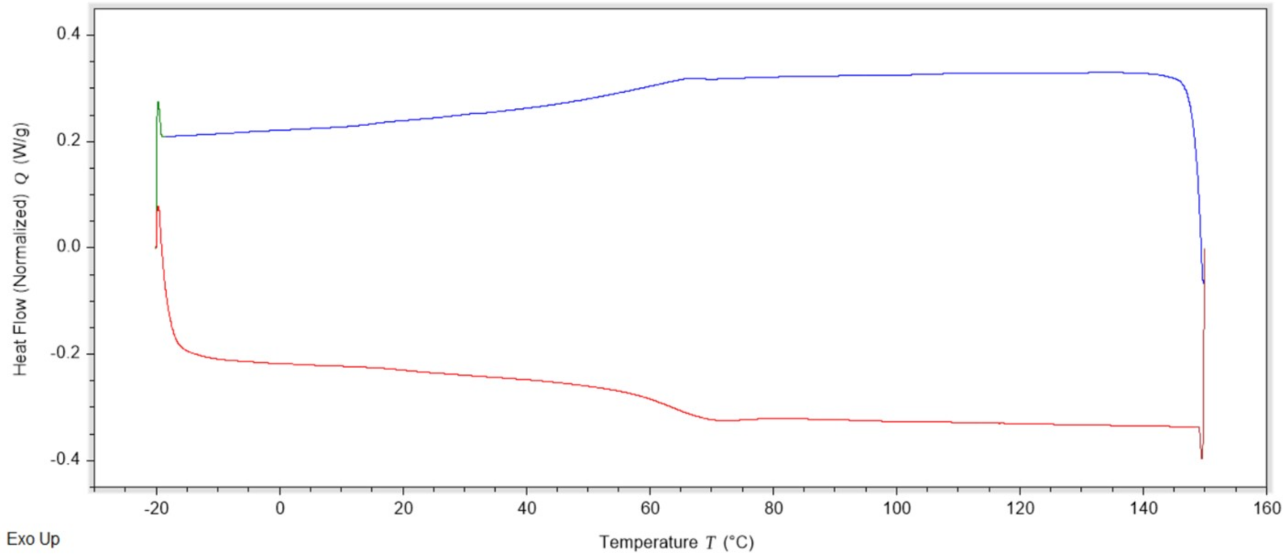

Figure S18. DSC analysis of $VO(Bet)_2(TFA)_2$.

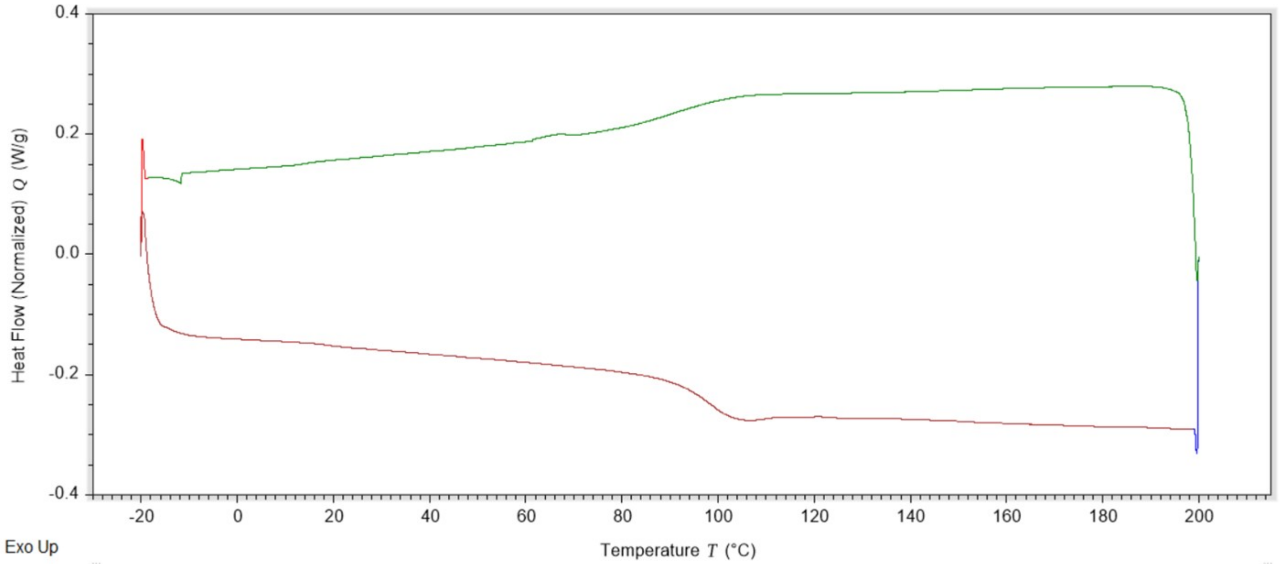

Figure S19. DSC analysis of $VO(Bet)_2(MsO)_2$.

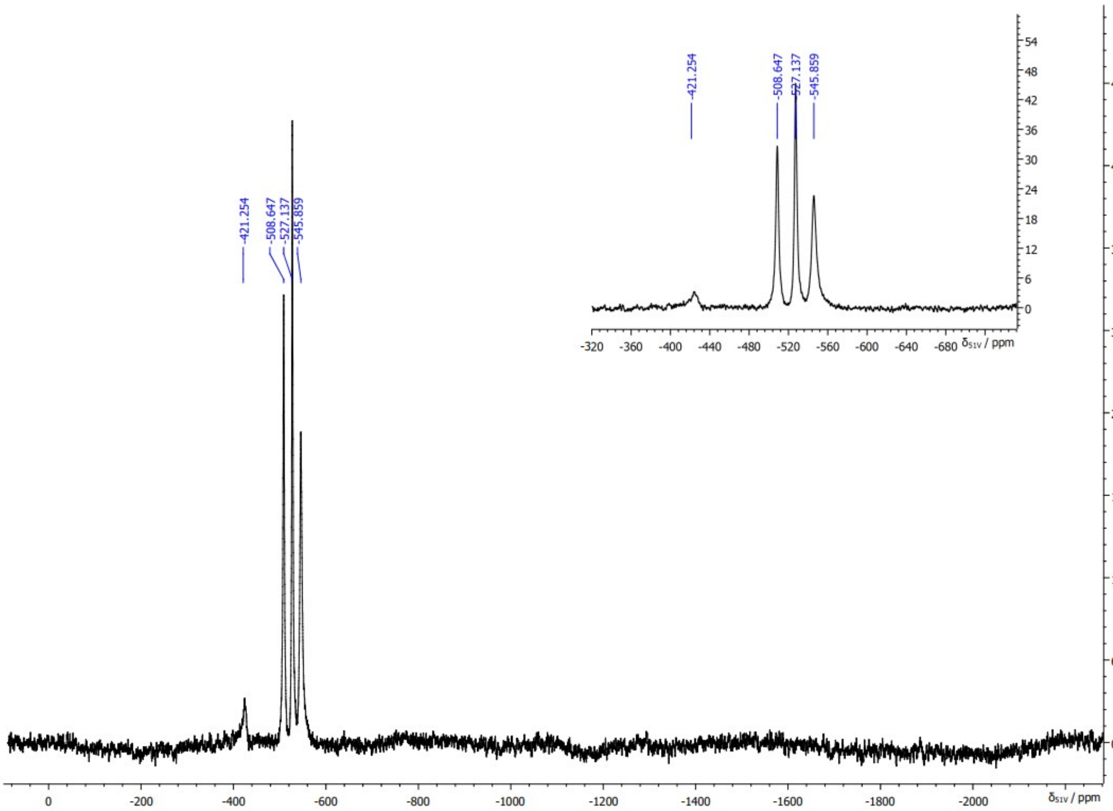

Figure S20. ^{51}V-NMR spectra of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 2.

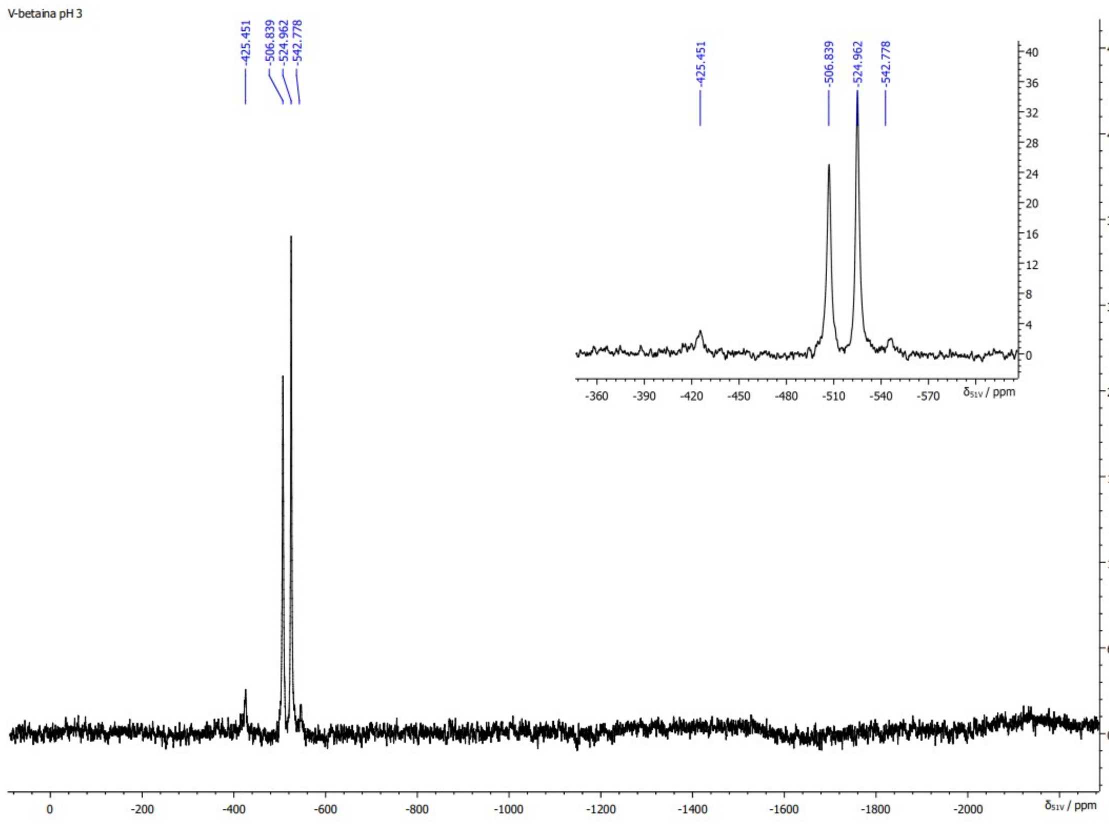

Figure S21. ^{51}V-NMR spectra of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 3.

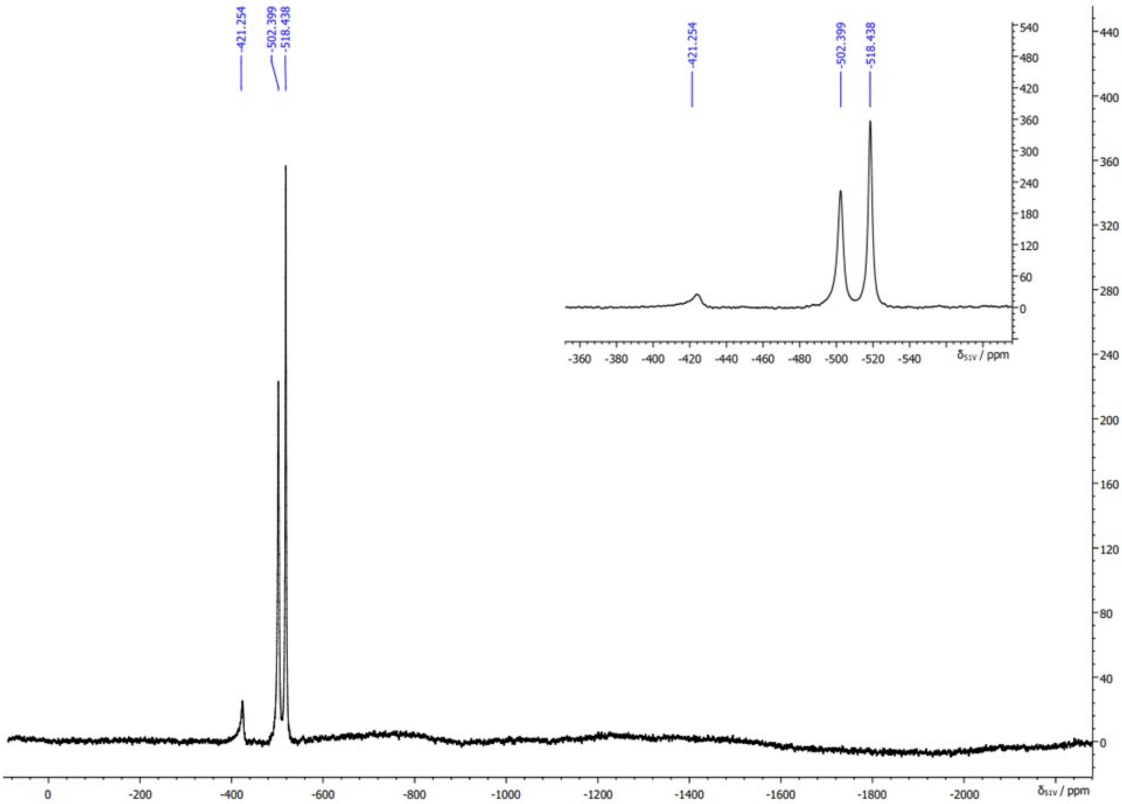

Figure S22. ^{51}V-NMR spectra of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 4.

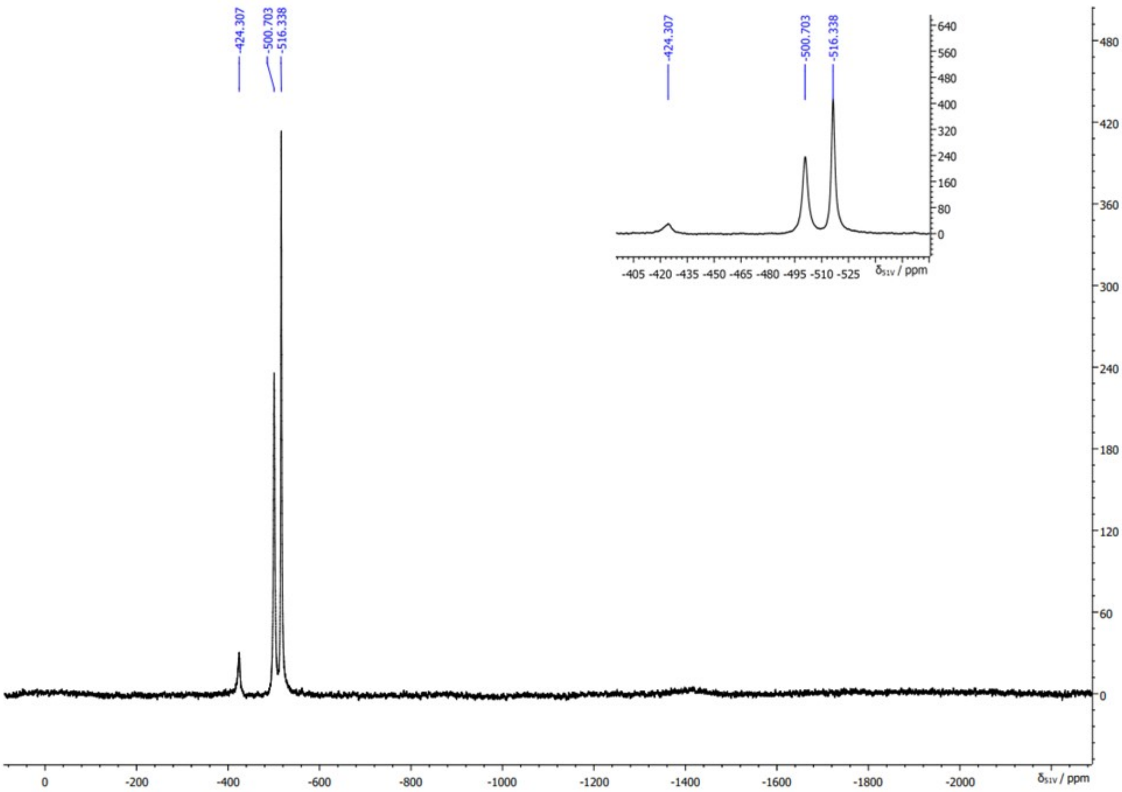

Figure S23. ^{51}V-NMR spectra of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 5.

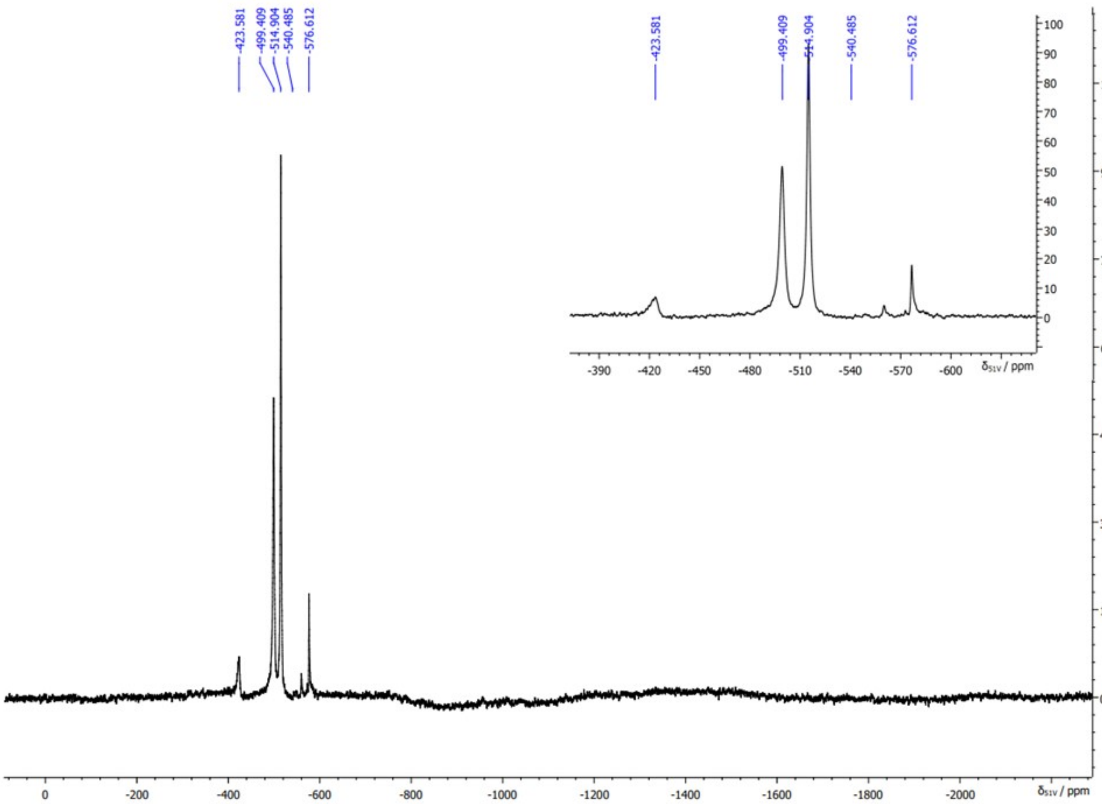

Figure S24. ^{51}V-NMR spectra of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 6.

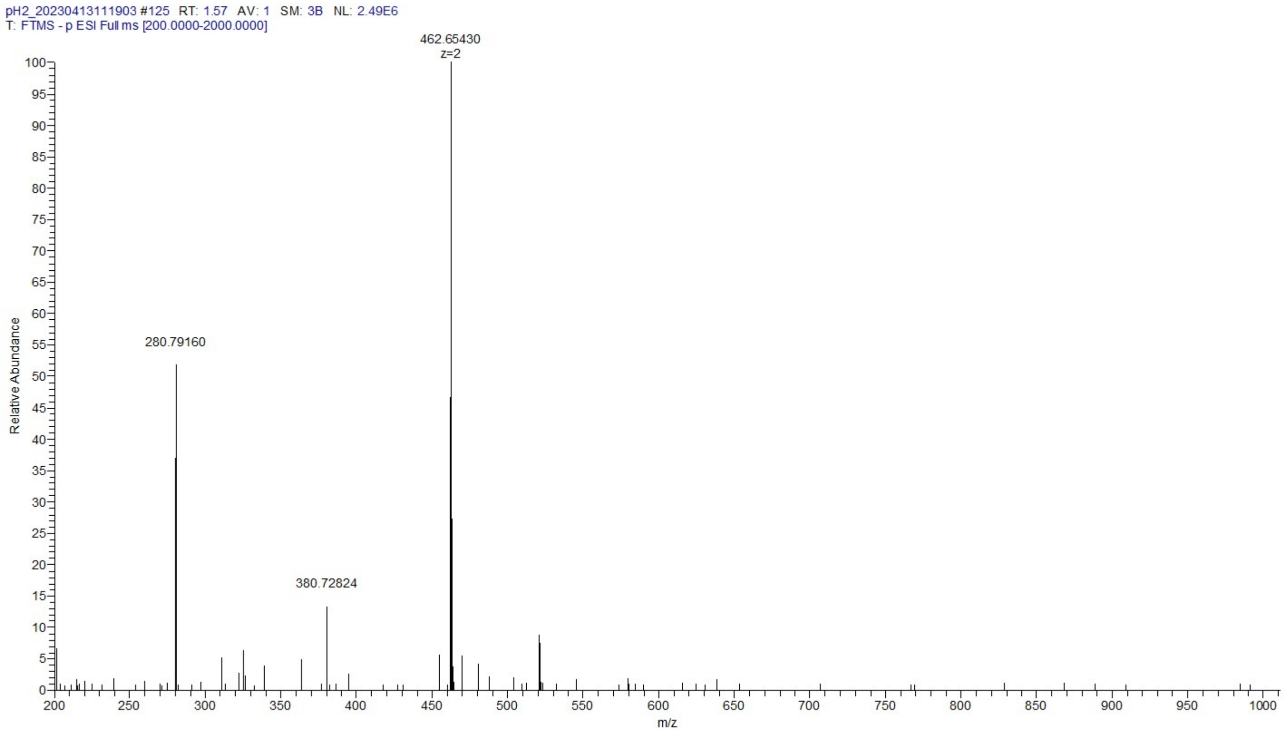

Figure S25. ESI-MS (-) spectrum of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 2.

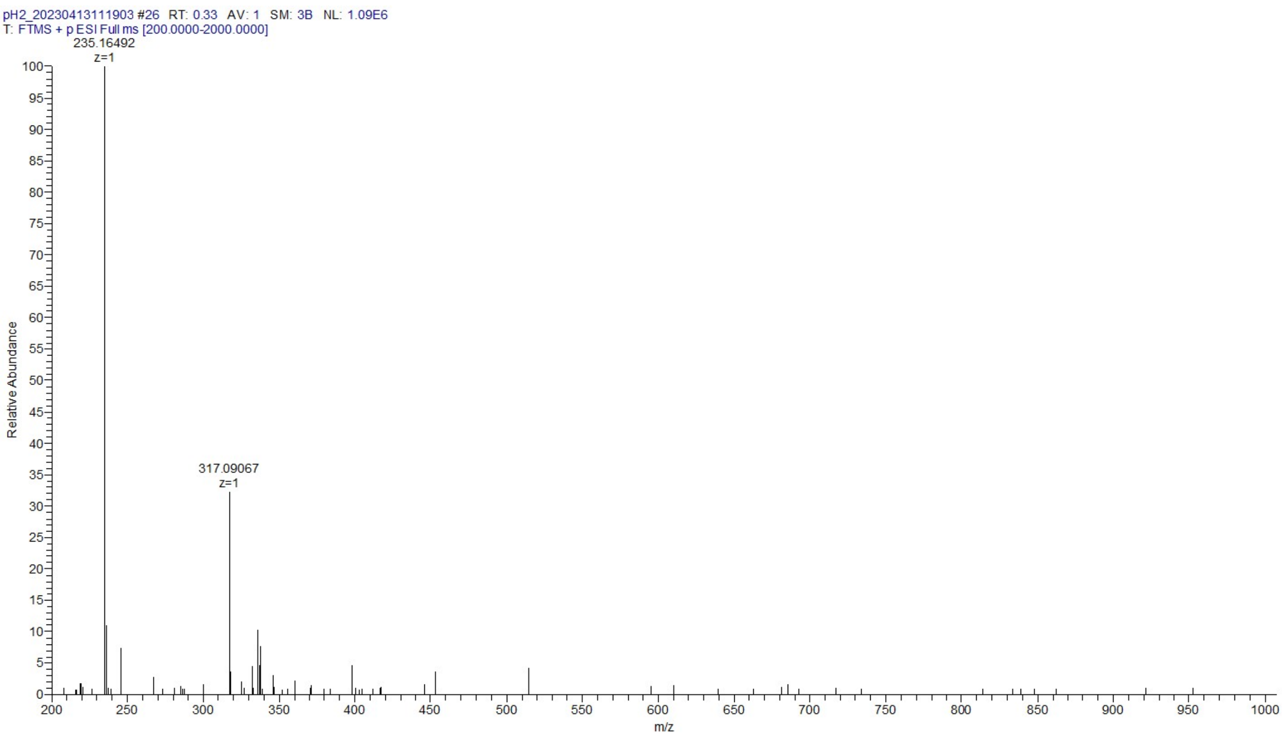

Figure S26. ESI-MS (+) spectrum of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 2.

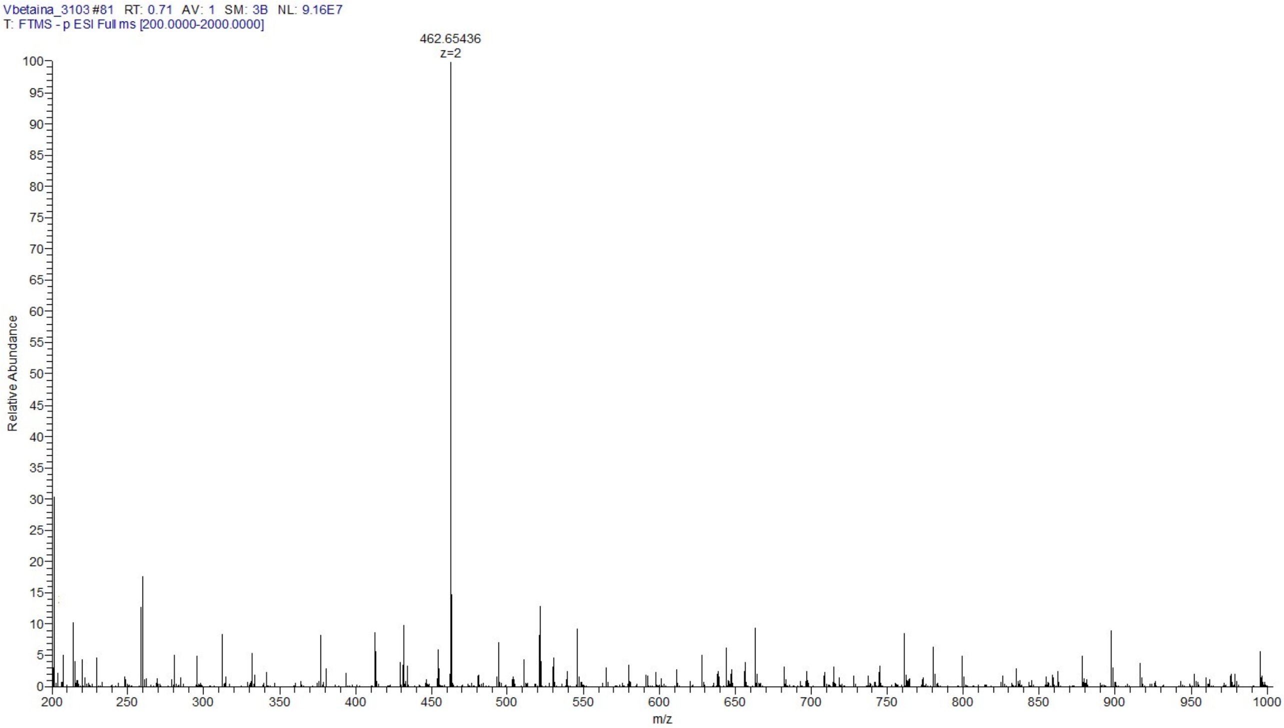

Figure S27. ESI-MS (-) spectrum of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 4.

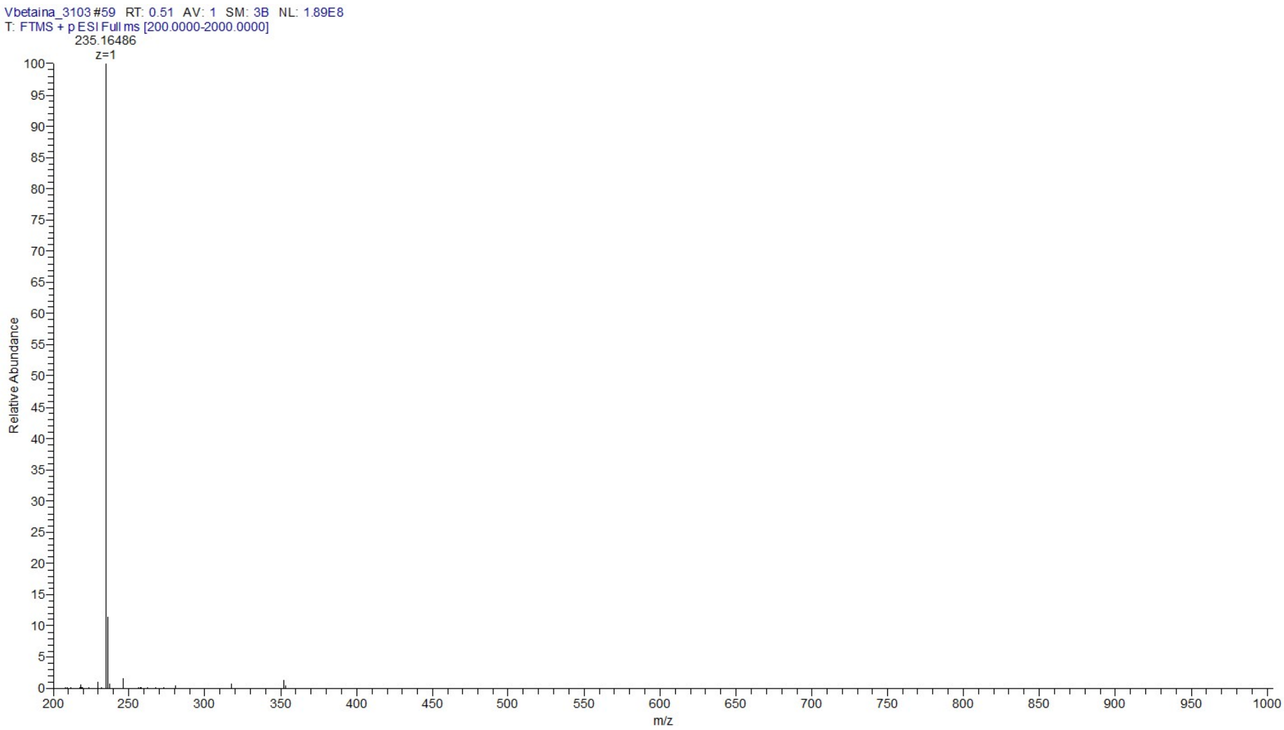

Figure S28. ESI-MS (+) spectrum of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 4

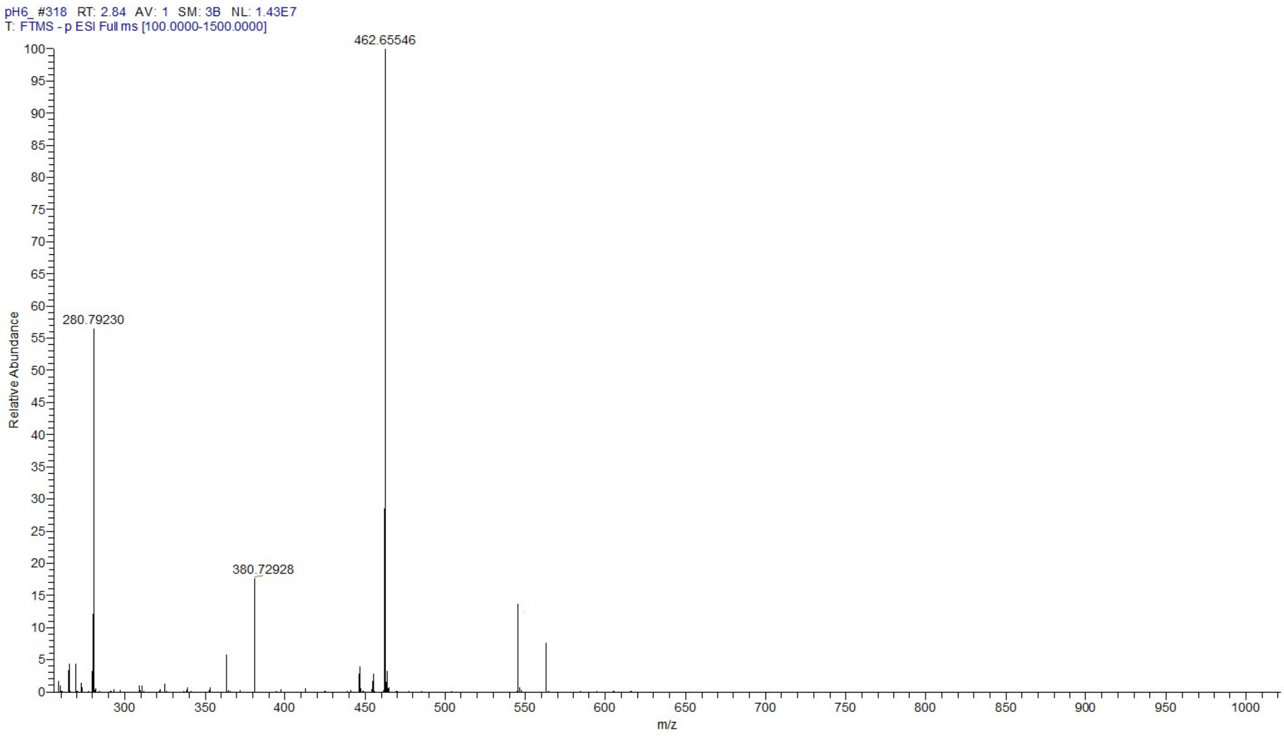

Figure S29. ESI-MS (-) spectrum of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 6.

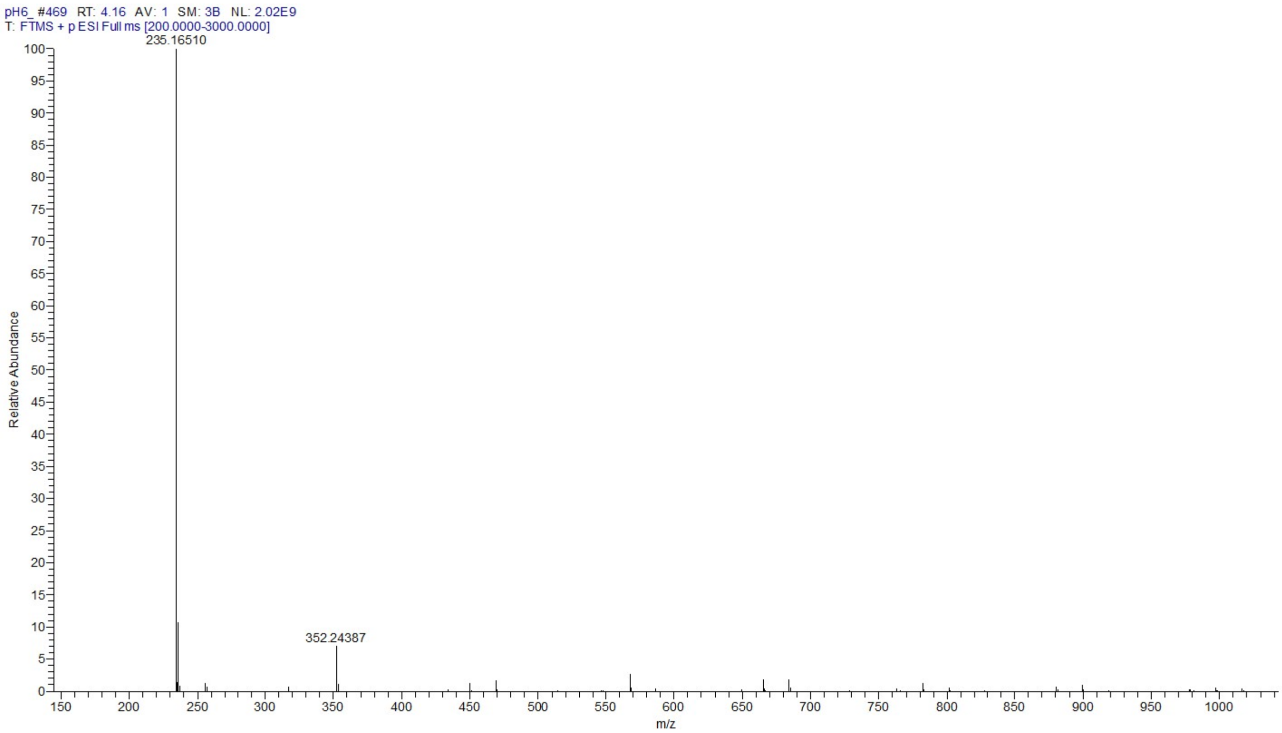

Figure S30. ESI-MS (+) spectrum of electrochemically oxidized aqueous solutions of $VO(Bet)_2SO_4$, betaine and ammonium chloride (1:3:5) at pH = 6.