A multi-faceted approach to probe organic phase composition in TODGA systems with 1-alcohol phase modifiers

Supplemental Information

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Solvent Extraction

Table S1. Separation Factors for Dy/Nd and Dy/Tb for 1-dodecanol

vol%	SF	1-dodecanol
0	Dy/Nd Dy/Tb	58.5 2.38
5	Dy/Nd Dy/Tb	57.5 2.02
30	Dy/Nd Dy/Tb	- -

Table S2. Ratio of 1-dodecanol molecules per extracted H_2O Molecules

vol%	1-dodecanol
5	18.58
30	-

Relation between TODGA, HNO_3, and H_2O

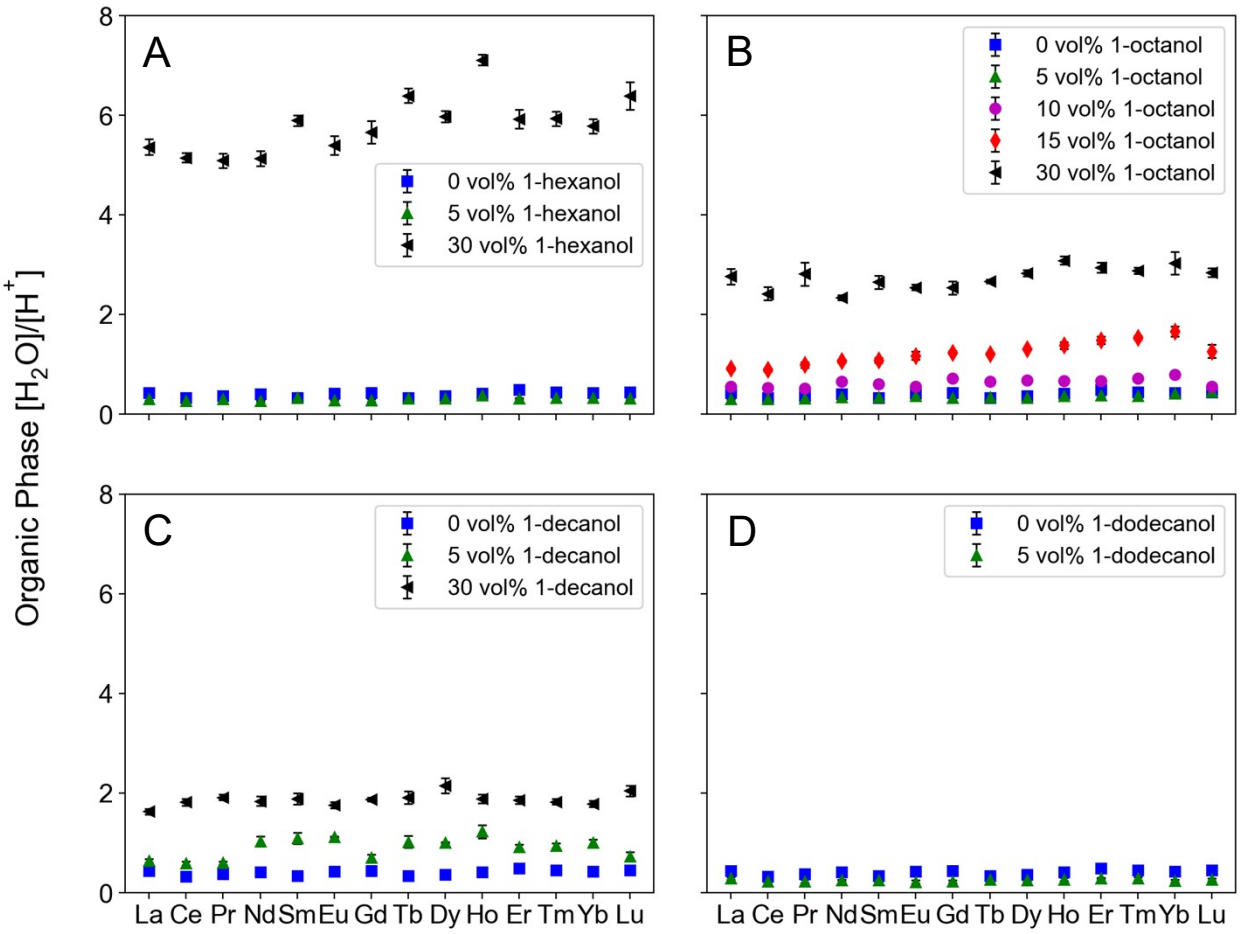


Figure S1. The ratio of co-extracted H_2O molecules per H^+ cation, for all systems studied (A) 1-hexanol, (B) 1-octanol, (C) 1-decanol, and (D) 1-dodecanol.

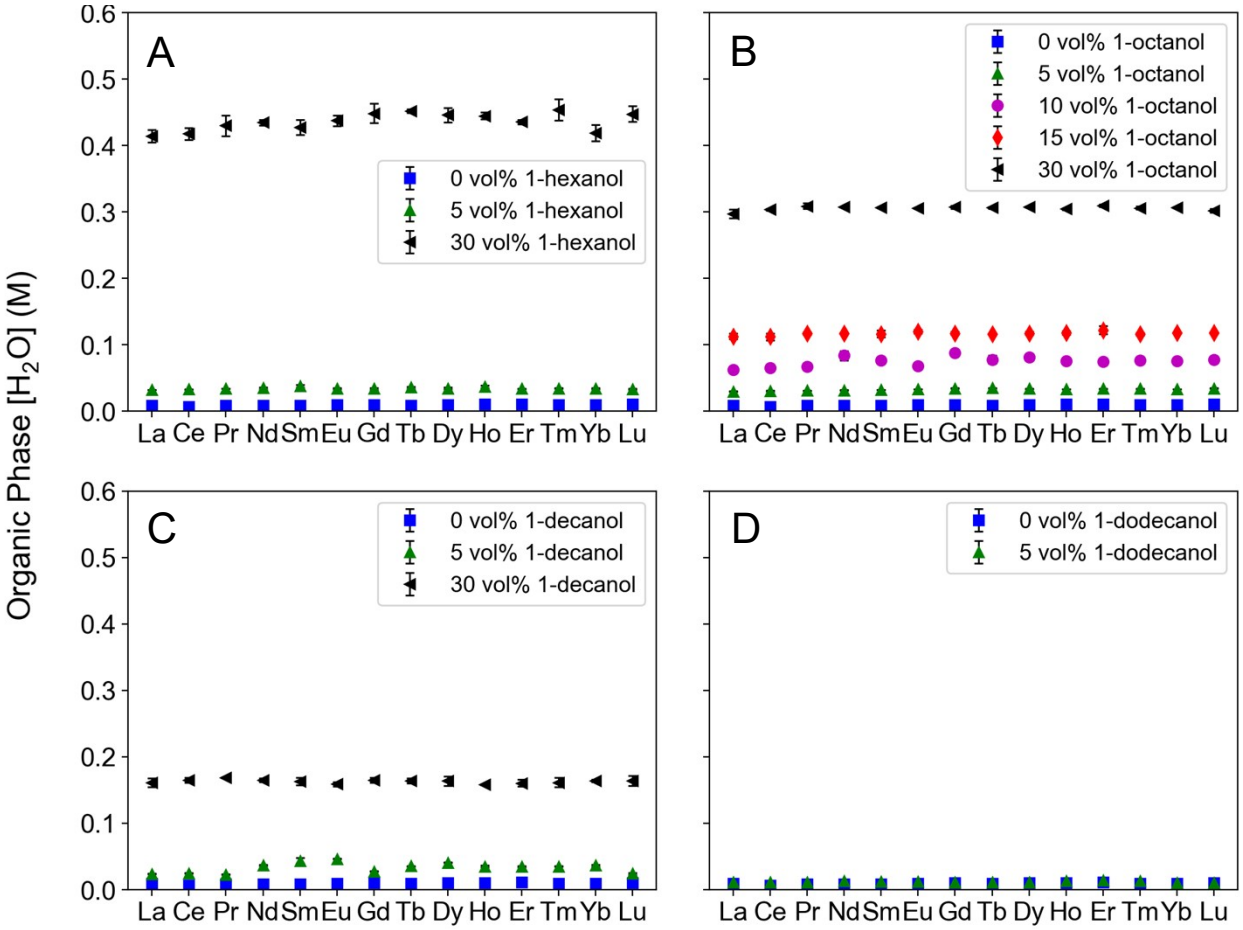


Figure S2. Organic phase H_2O concentration across the Ln period for systems containing (A) 0 vol%, 5 vol%, or 30 vol% 1-hexanol, (B) 0 vol%, 5 vol%, 10 vol%, 15 vol%, or 30 vol% 1-octanol, (C) 0 vol%, 5 vol%, or 30 vol% 1-decanol and (D) 0 vol% or 5 vol% 1-dodecanol. For each system tested, 0 vol% (blue, squares), 5 vol% (green triangles), 10 vol% (magenta circles), 15 vol% (red diamonds), and 30 vol% (black left-triangles). Error bars represent propagated uncertainty from preparing samples, instrument analysis, and sample standard deviation.

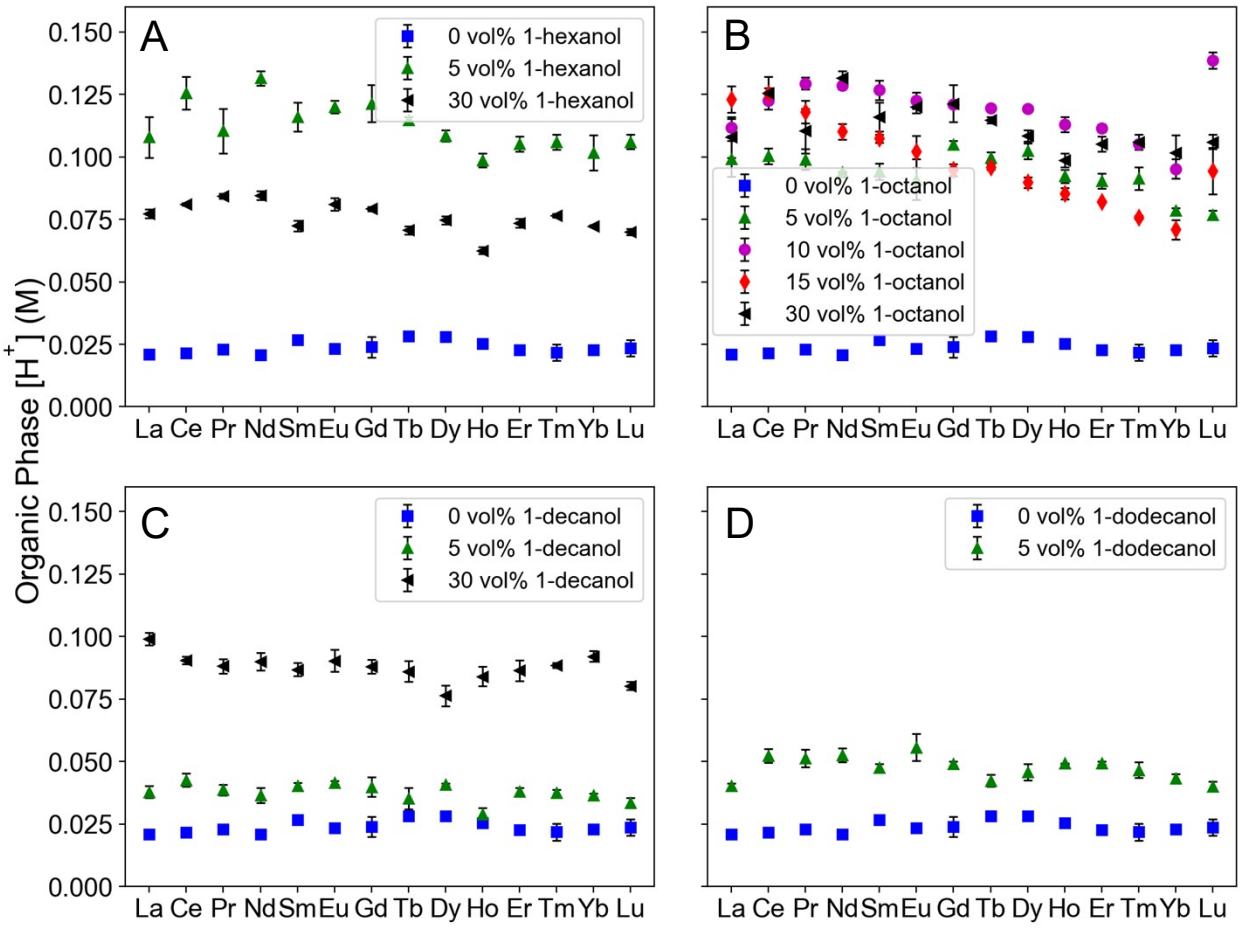


Figure S3. Organic phase H+ concentration across the Ln period for systems containing (A) 0 vol%, 5 vol%, or 30 vol% 1-hexanol, (B) 0 vol%, 5 vol%, 10 vol%, 15 vol%, or 30 vol% 1-octanol, (C) 0 vol%, 5 vol%, or 30 vol% 1-decanol and (D) 0 vol% or 5 vol% 1-dodecanol. For each system tested, 0 vol% (blue, squares), 5 vol% (green triangles), 10 vol% (magenta circles), 15 vol% (red diamonds), and 30 vol% (black left-triangles). Error bars represent propagated uncertainty from preparing samples, instrument analysis, and sample standard deviation.

FT-IR Spectra

Full Spectra

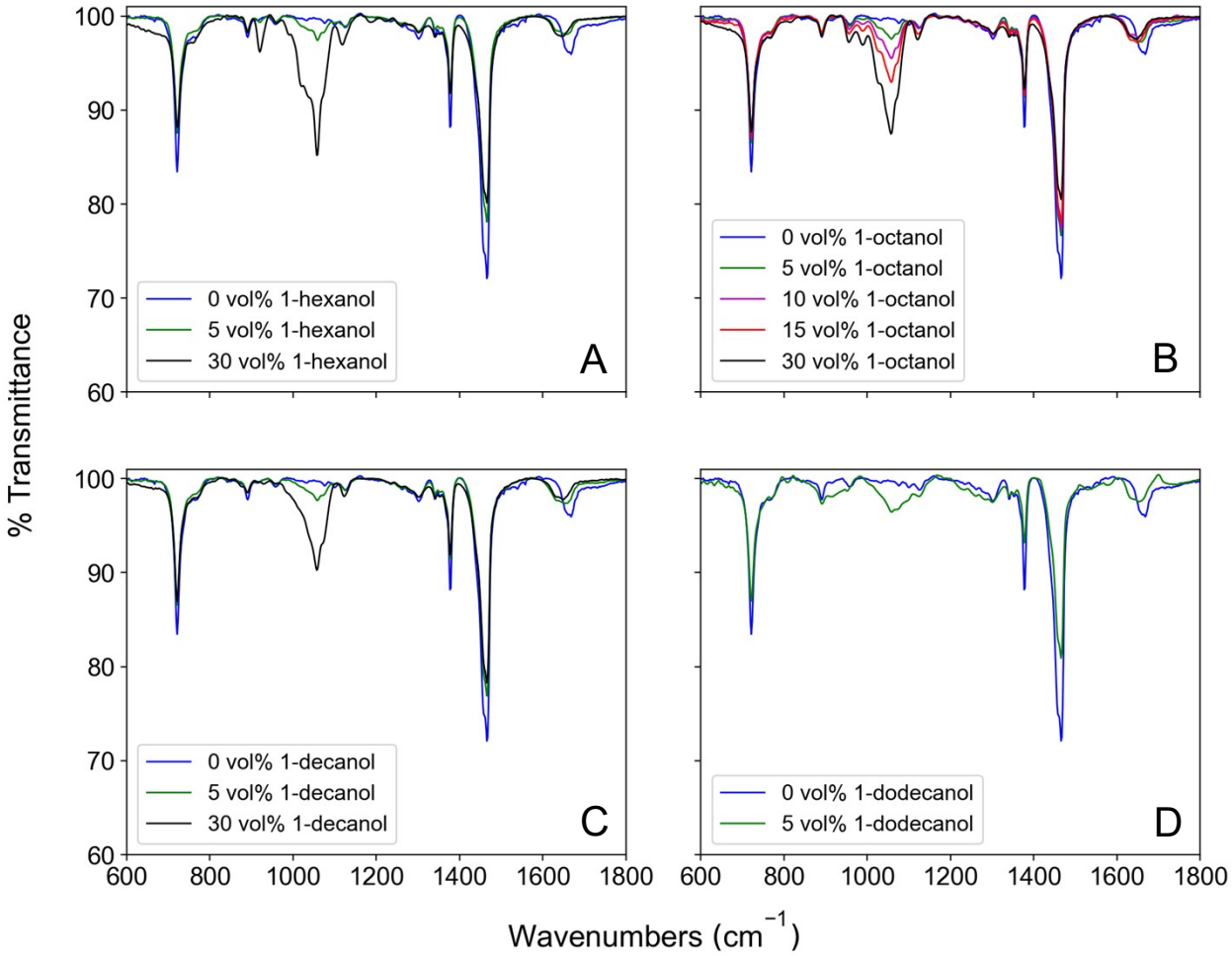


Figure S4. IR spectra of fresh organic phases, (A) 1-hexanol, (B) 1-octanol, (C) 1-decanol, (D) 1-dodecanol.

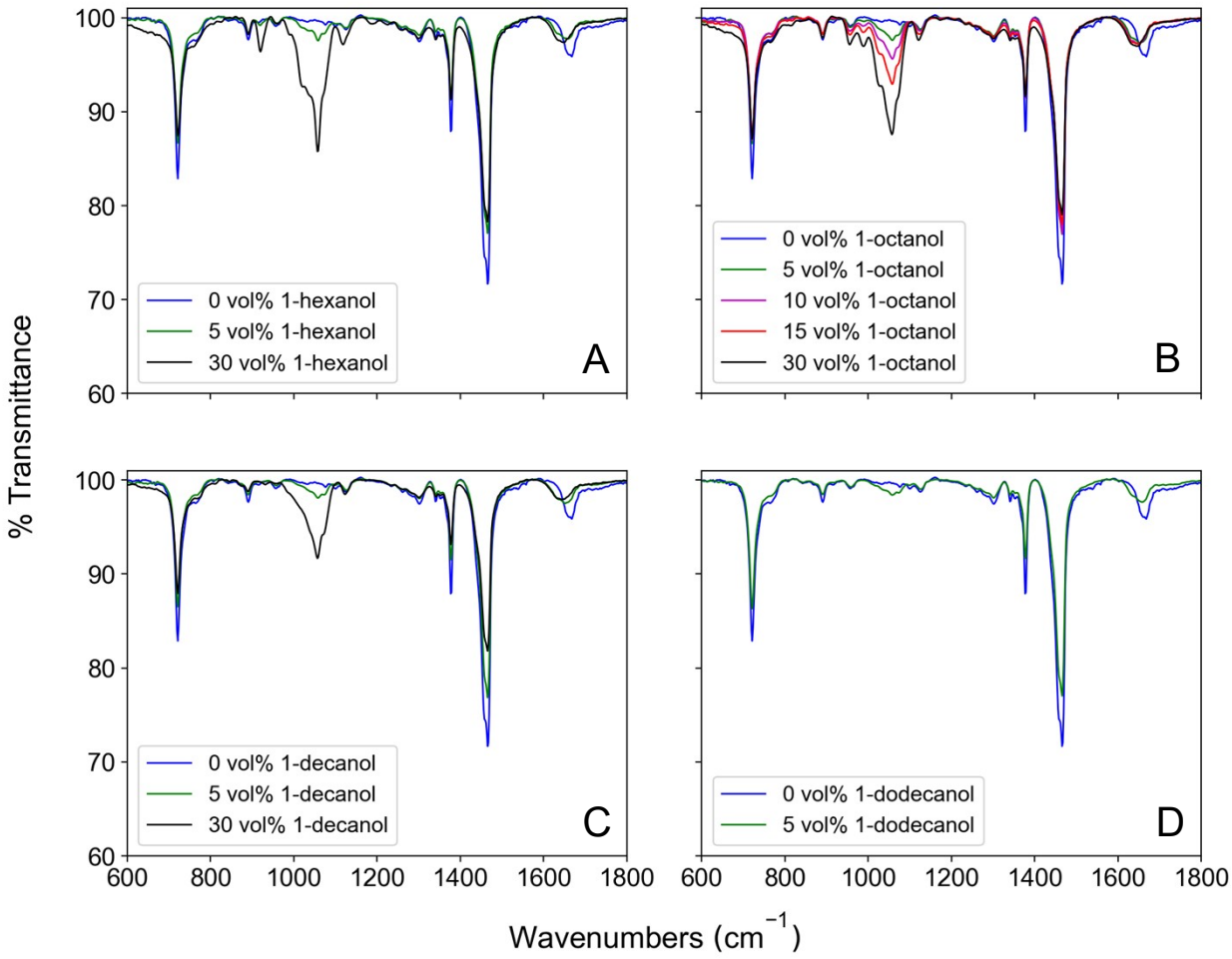


Figure S5. IR spectra of organic phases after contact with 1 M HNO_3, (A) 1-hexanol, (B) 1-octanol, (C) 1-decanol, (D) 1-dodecanol.

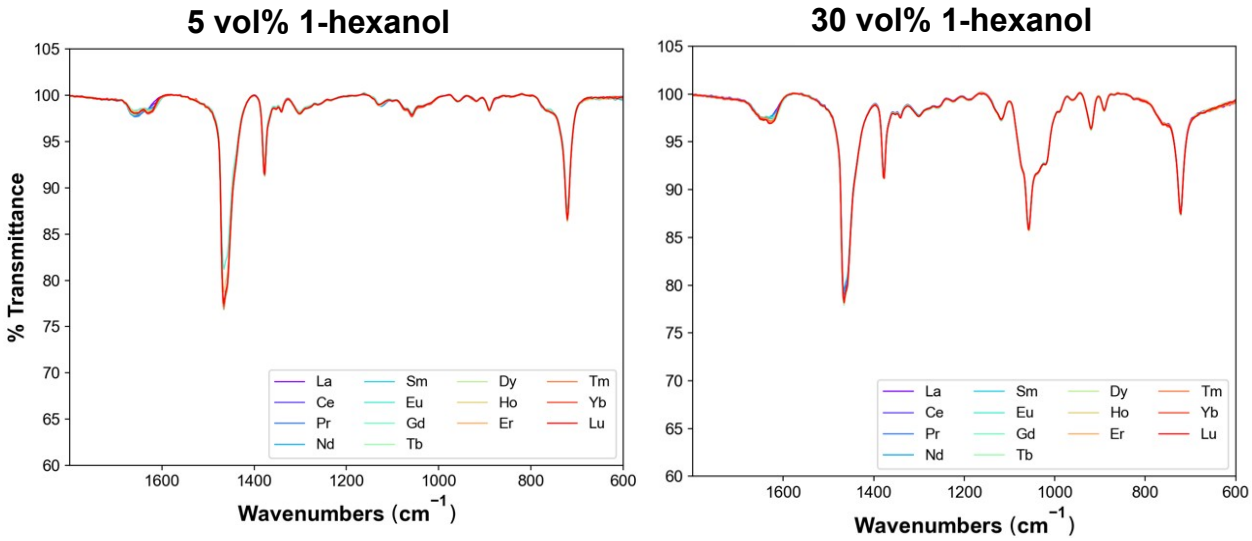


Figure S6. IR spectra of 1-hexanol containing organic phases following Ln contact. (left) organic phase containing 5 vol% 1-hexanol and (right) organic phase containing 30 vol% 1-hexanol.

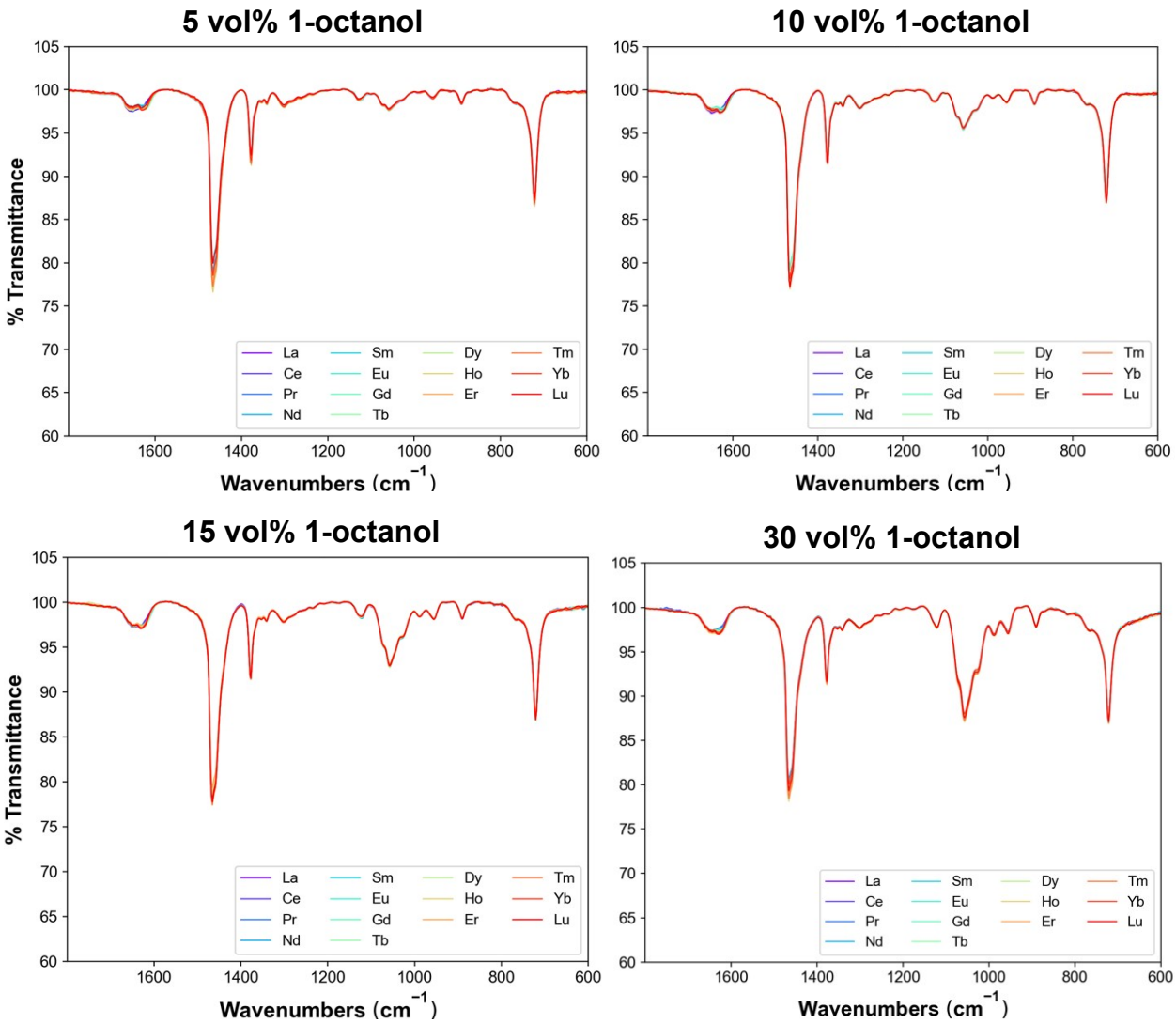


Figure S7. IR spectra of 1-octanol containing organic phases following Ln contact. Organic phases were containing (top left) 5 vol% 1-octanol, (top right) 10 vol% 1-octanol, (bottom left) 15 vol% 1-octanol, and (bottom right) 30 vol% 1-octanol.

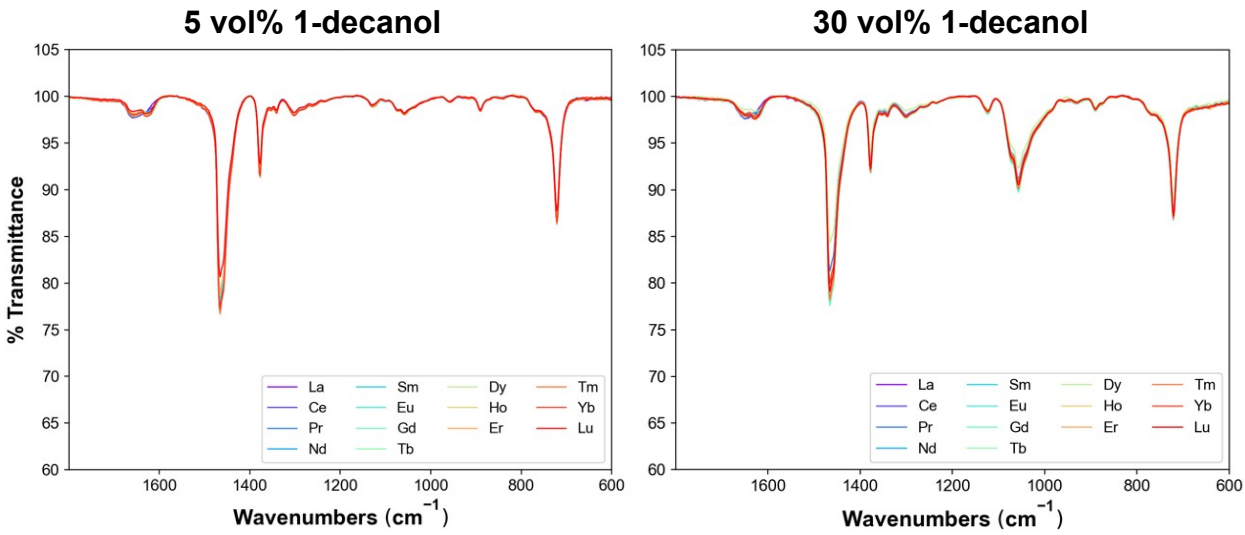


Figure S8. IR spectra of 1-decanol containing organic phases following Ln contact. Organic phases were containing (left) 5 vol% 1-decanol and (right) 30 vol% 1-decanol.

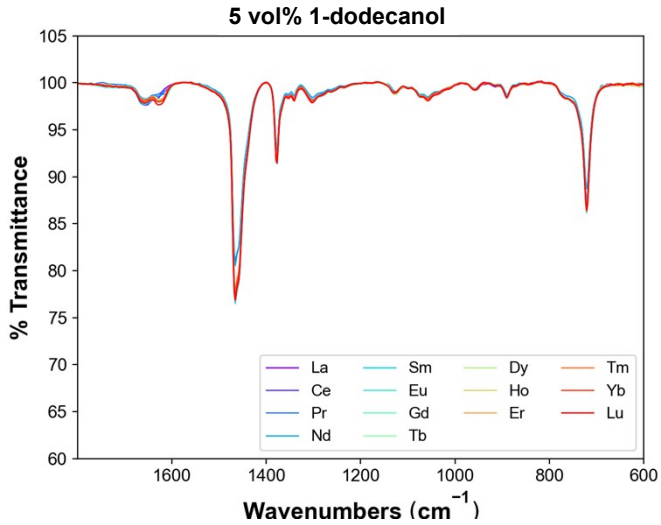


Figure S9. IR spectra of 1-dodecanol containing organic phases following Ln contact. Organic phases were containing 5 vol% 1- dodecanol.

Carbonyl Spectra

Listed Frequencies

Table S3. Frequencies of the carbonyl peaks(s) in the organic phase for the fresh organic phase (TODGA), after pre-equilibrium (HNO_3), and after contact with each Ln.

Sample	0 vol% 1-alcohol	5 vol% 1-hexanol	30 vol% 1-hexanol	5 vol% 1-octanol	30 vol% 1-octanol	5 vol% 1-decanol	30 vol% 1-decanol	5 vol% 1-dodecanol
TODGA	1662	1635/1661	1643	1648	1639/1659	1640/1664	1629/1652	1650
HNO_3	1661/1670	1635/1660	1638/1660	1636/1660	1637/1658	1637/1662	1635/1657	1633/1659
La	1645	1636	1630	1605	1627	1637	1628	1637
Ce	1621	1634	1624	1610	1625	1617	1623	1632
Pr	1618	1612	1625	1618	1619	1621	1622	1631
Nd	1617	1623	1620	1614	1619	1612	1620	1624
Sm	1615	1612	1614	1623	1618	1621	1620	1622
Eu	1615	1623	1617	1623	1619	1622	1622	1622
Gd	1616	1624	1620	1622	1620	1622	1624	1623
Tb	1617	1624	1620	1623	1620	1621	1625	1621
Dy	1617	1624	1620	1625	1624	1624	1617	1622
Ho	1618	1624	1621	1626	1623	1624	1618	1623
Er	1618	1625	1622	1626	1624	1625	1619	1623
Tm	1619	1625	1622	1625	1623	1625	1621	1625
Yb	1619	1626	1624	1626	1623	1625	1624	1625
Lu	1620	1626	1623	1627	1625	1626	1622	1624

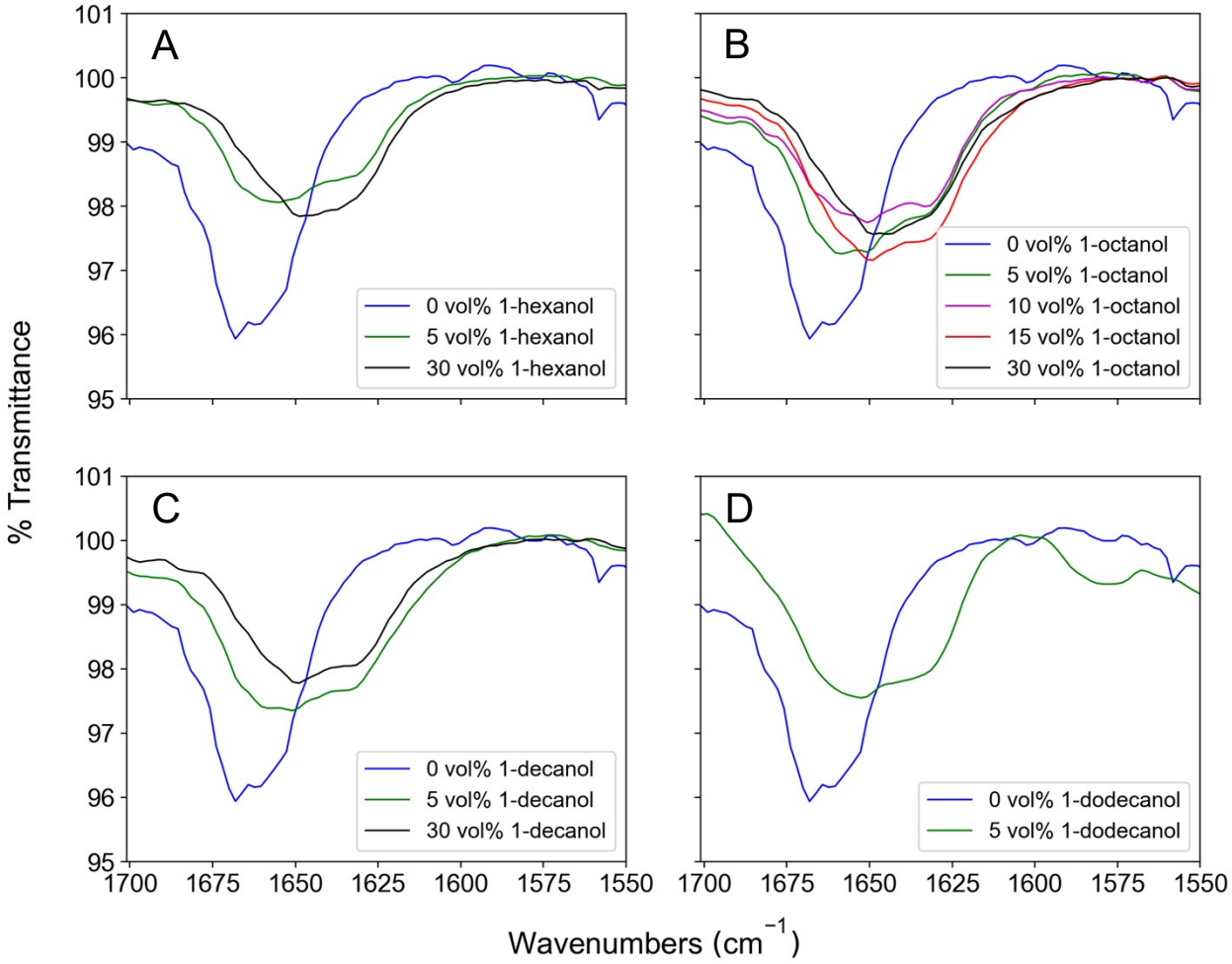


Figure S10. IR carbonyl spectra of fresh organic phases, (A) 1-hexanol, (B) 1-octanol, (C) 1-decanol, (D) 1-dodecanol.

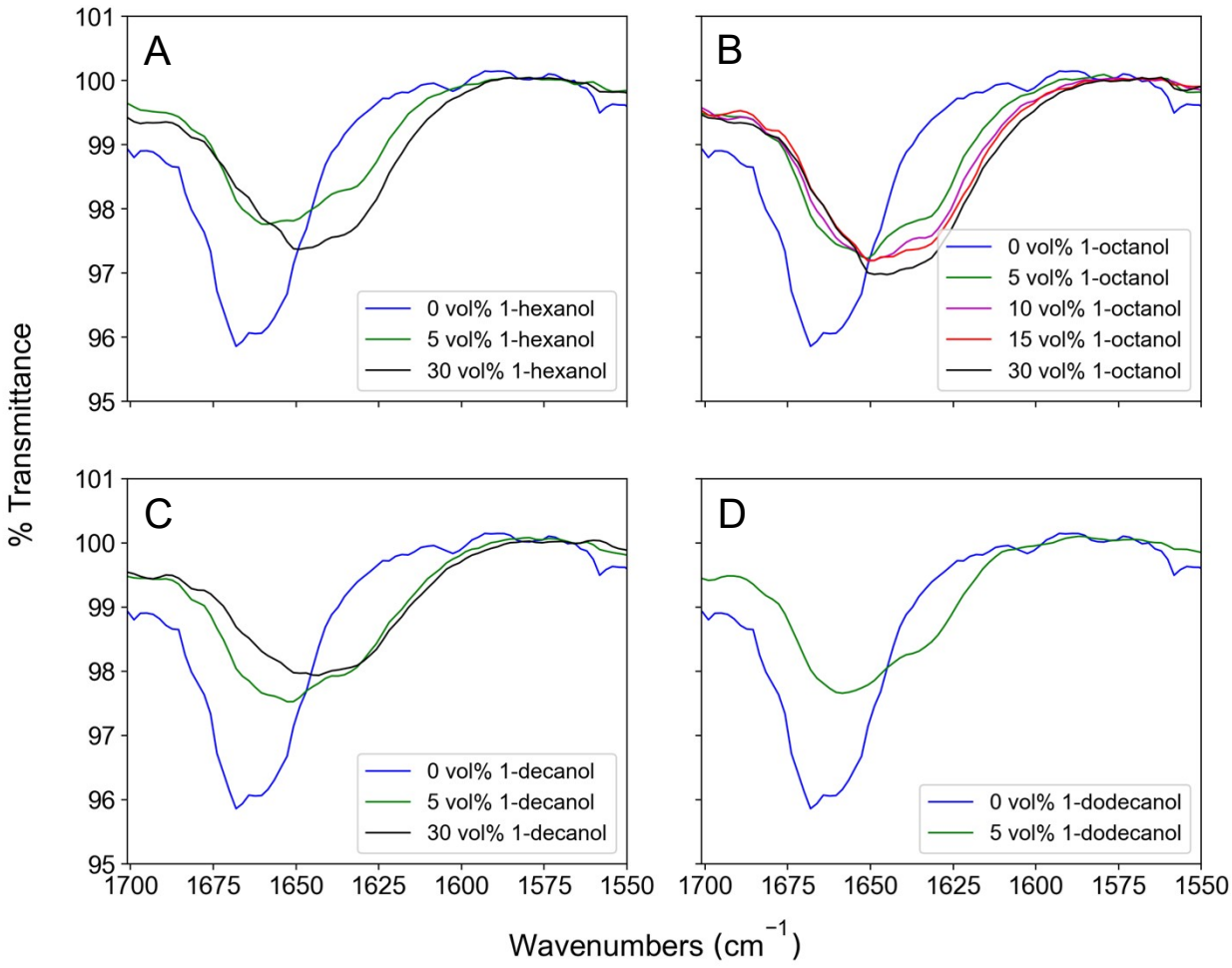


Figure S11. IR carbonyl spectra of organic phases after contact with 1 M HNO_3, (A) 1-hexanol, (B) 1-octanol, (C) 1-decanol, (D) 1-dodecanol.

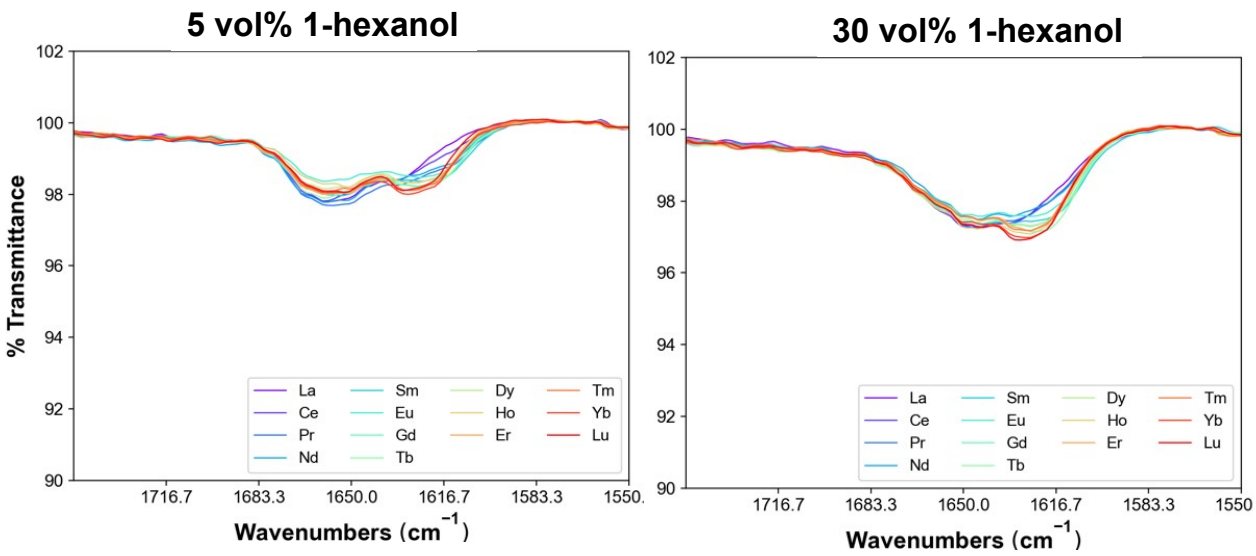


Figure S12. IR carbonyl spectra of 1-hexanol containing organic phases following Ln contact. (left) organic phase containing 5 vol% 1-hexanol and (right) organic phase containing 30 vol% 1-hexanol.

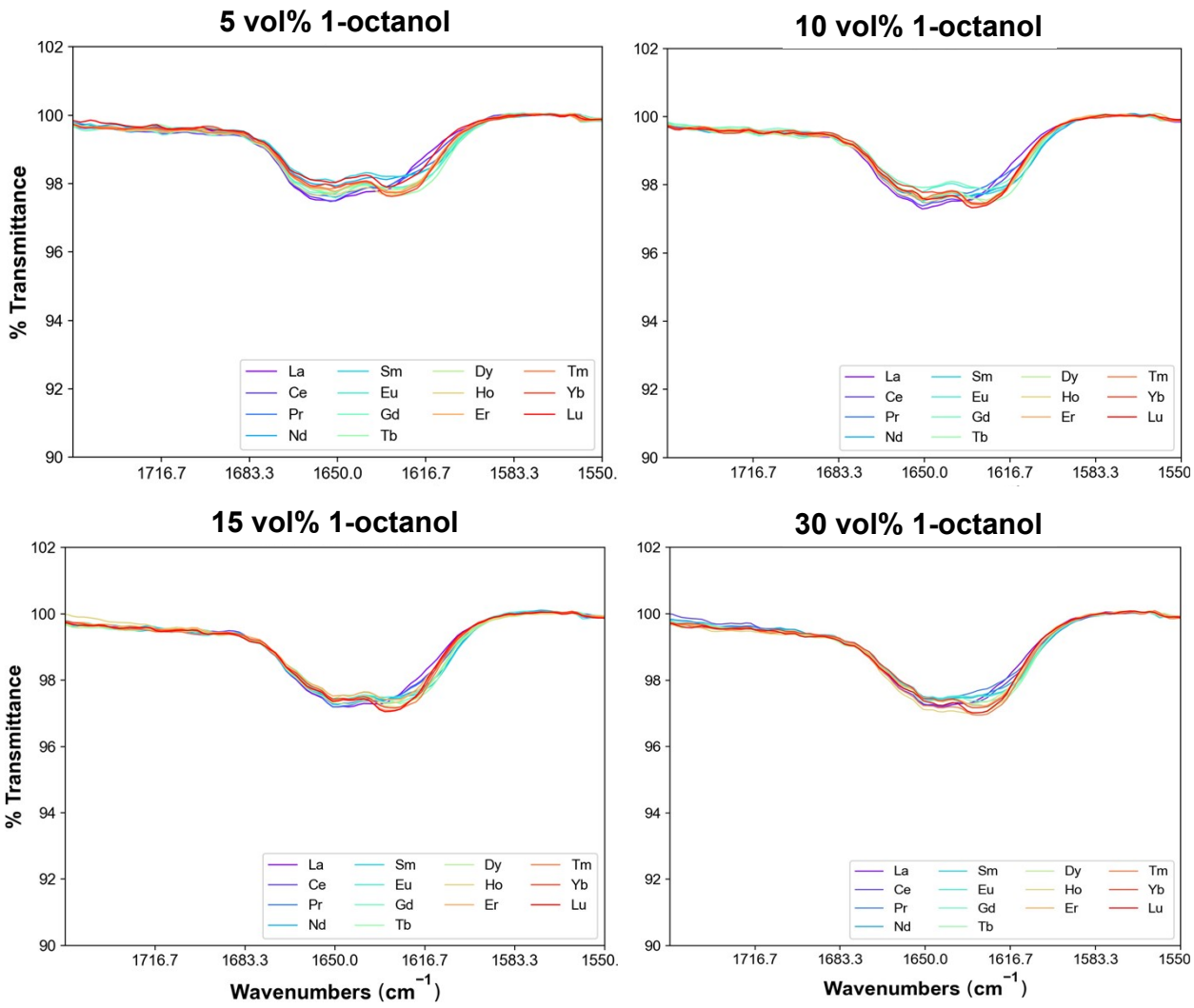


Figure S13. IR carbonyl spectra of 1-octanol containing organic phases following Ln contact. Organic phases were containing (top left) 5 vol% 1-octanol, (top right) 10 vol% 1-octanol, (bottom left) 15 vol% 1-octanol, and (bottom right) 30 vol% 1-octanol.

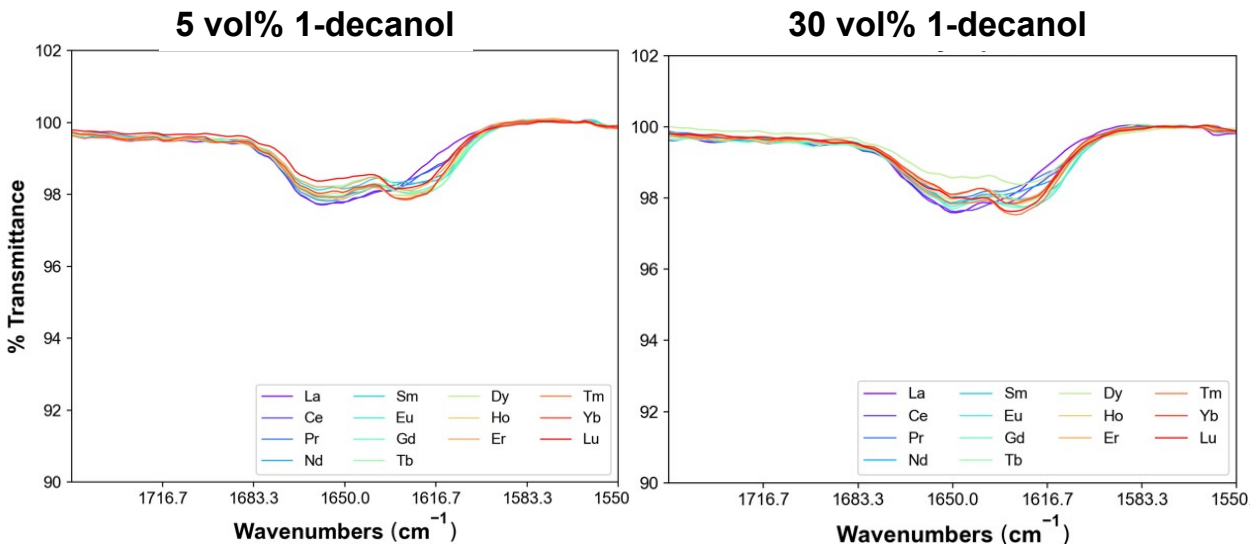


Figure S14. IR carbonyl spectra of 1-decanol containing organic phases following Ln contact. (left) organic phase containing 5 vol% 1-decanol and (right) organic phase containing 30 vol% 1-decanol.

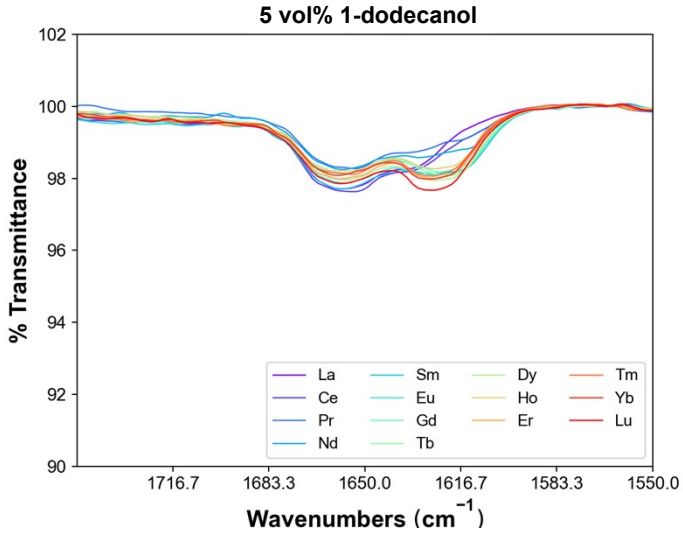


Figure S15. IR carbonyl spectra of 1-dodecanol containing organic phases following Ln contact. Organic phases were containing (left) 5 vol% 1- dodecanol and (right) 30 vol% 1- dodecanol.

Fitted Carbonyl Spectra Comparisons

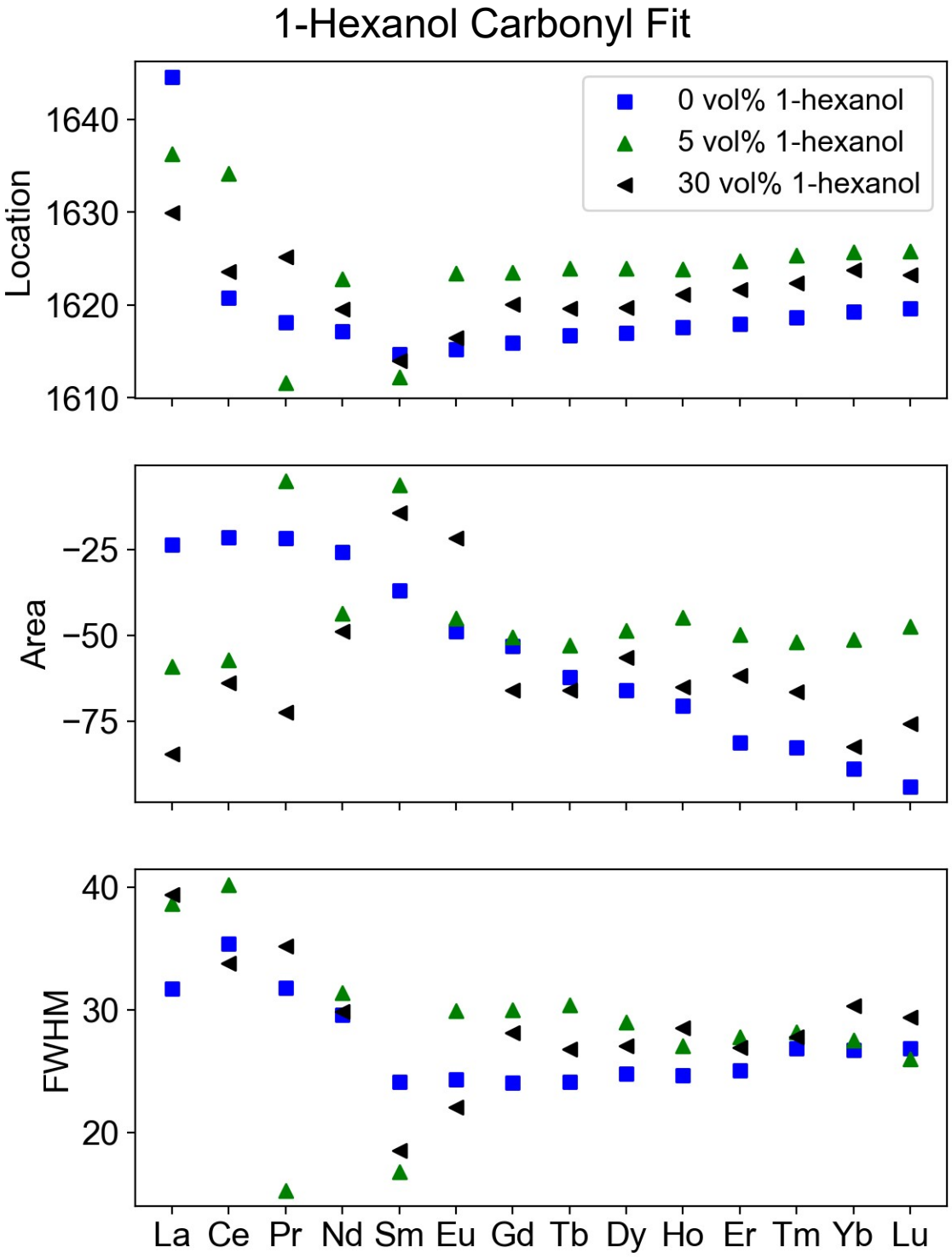


Figure S16. Results from fitting the carbonyl peaks after Ln contact for 1-hexanol systems in OriginLab. Peak analysis yielded three peak properties, location (wavenumber), area, and FWHM.

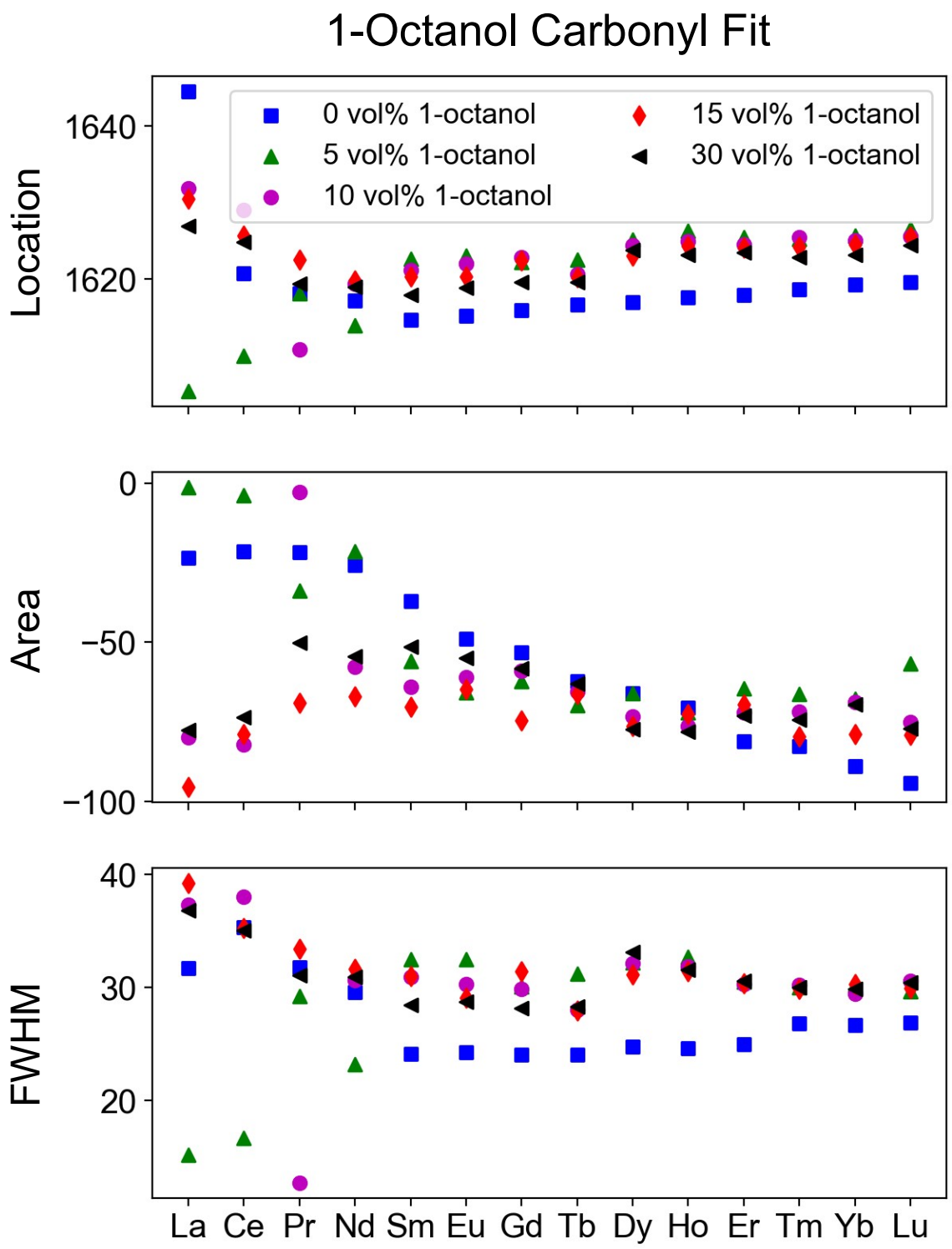


Figure S17. Results from fitting the carbonyl peaks after Ln contact for 1-octanol systems in OriginLab. Peak analysis yielded three peak properties, location (wavenumber), area, and FWHM.

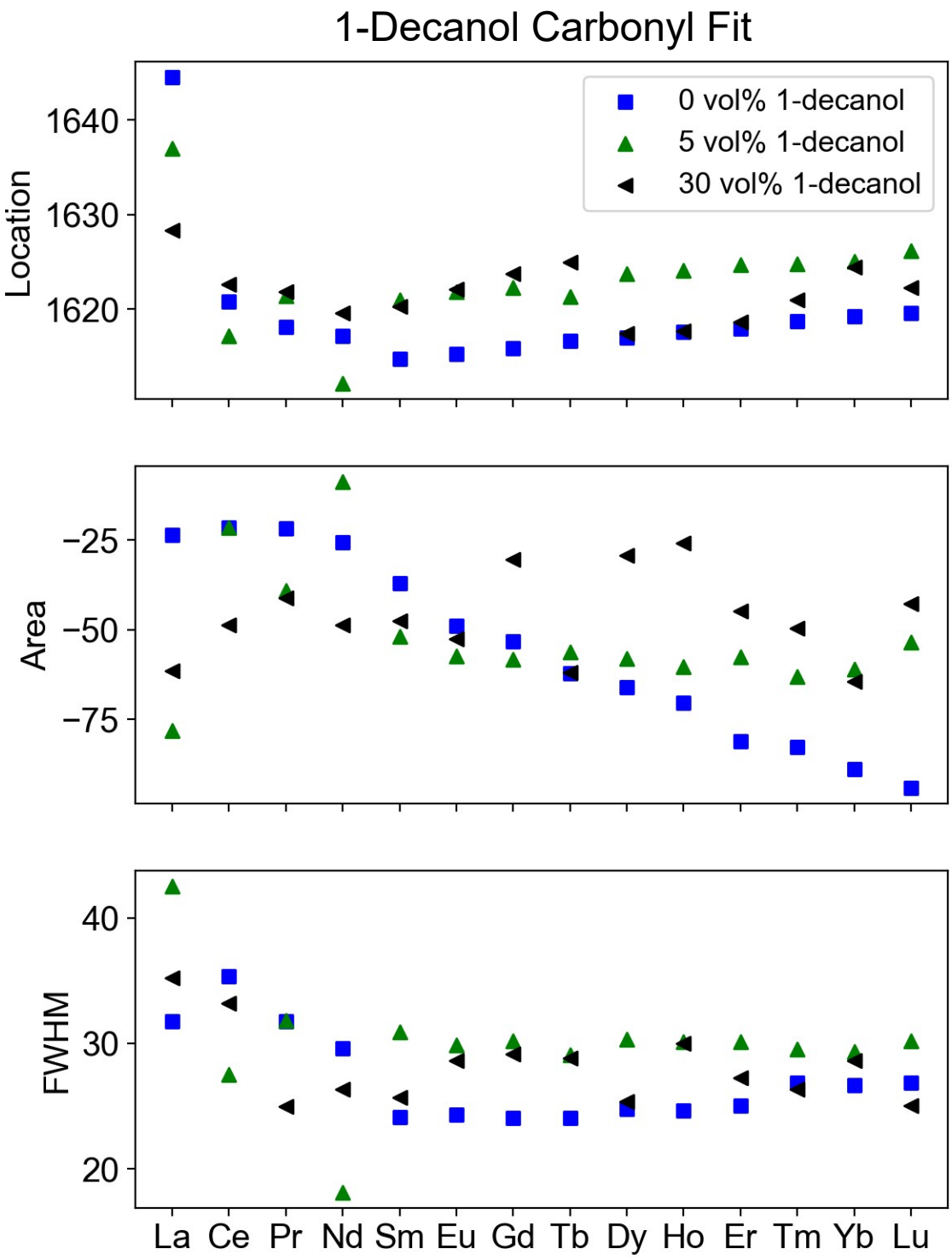


Figure S18. Results from fitting the carbonyl peaks after Ln contact for 1-decanol systems in OriginLab. Peak analysis yielded three peak properties, location (wavenumber), area, and FWHM.

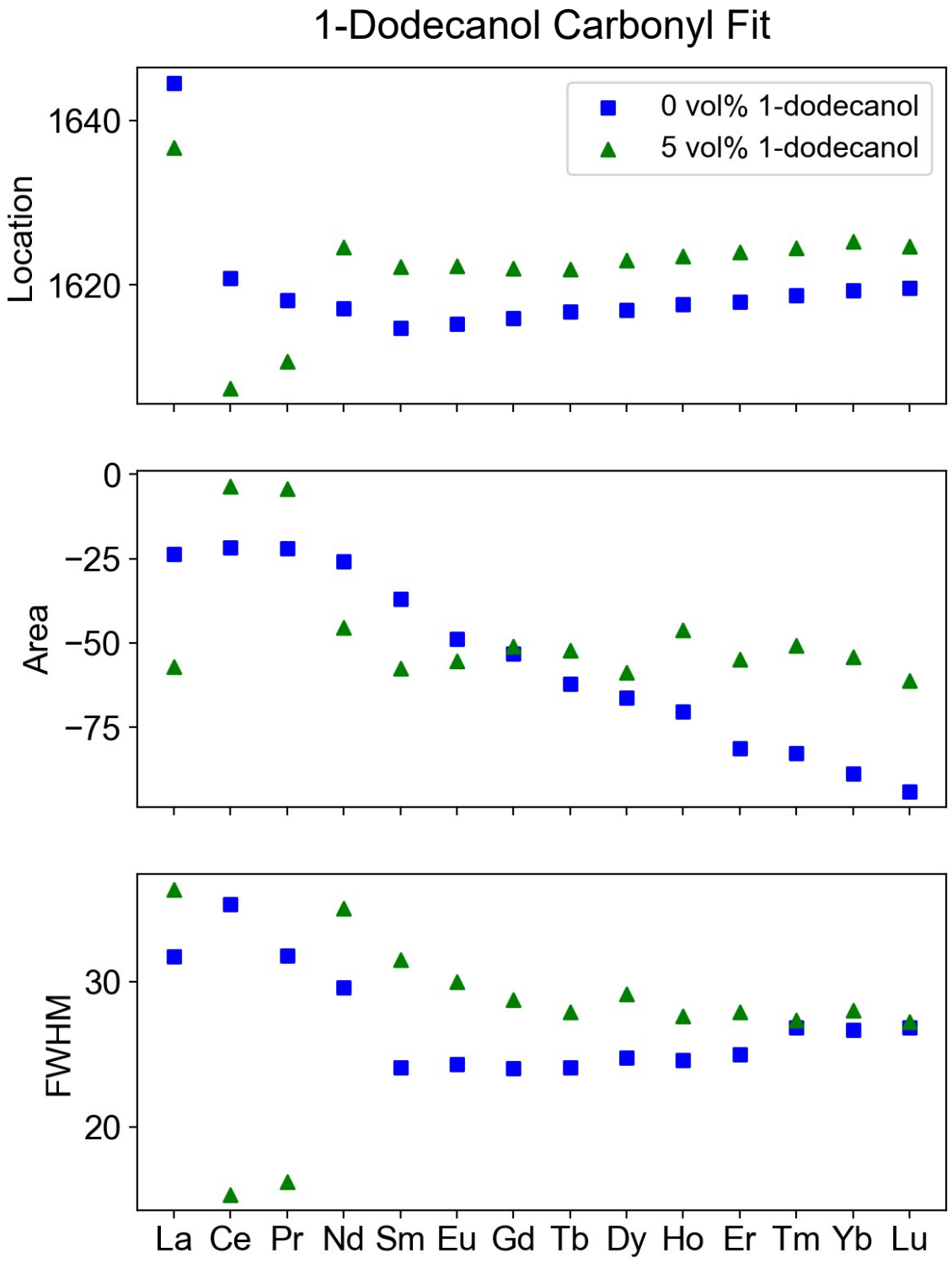
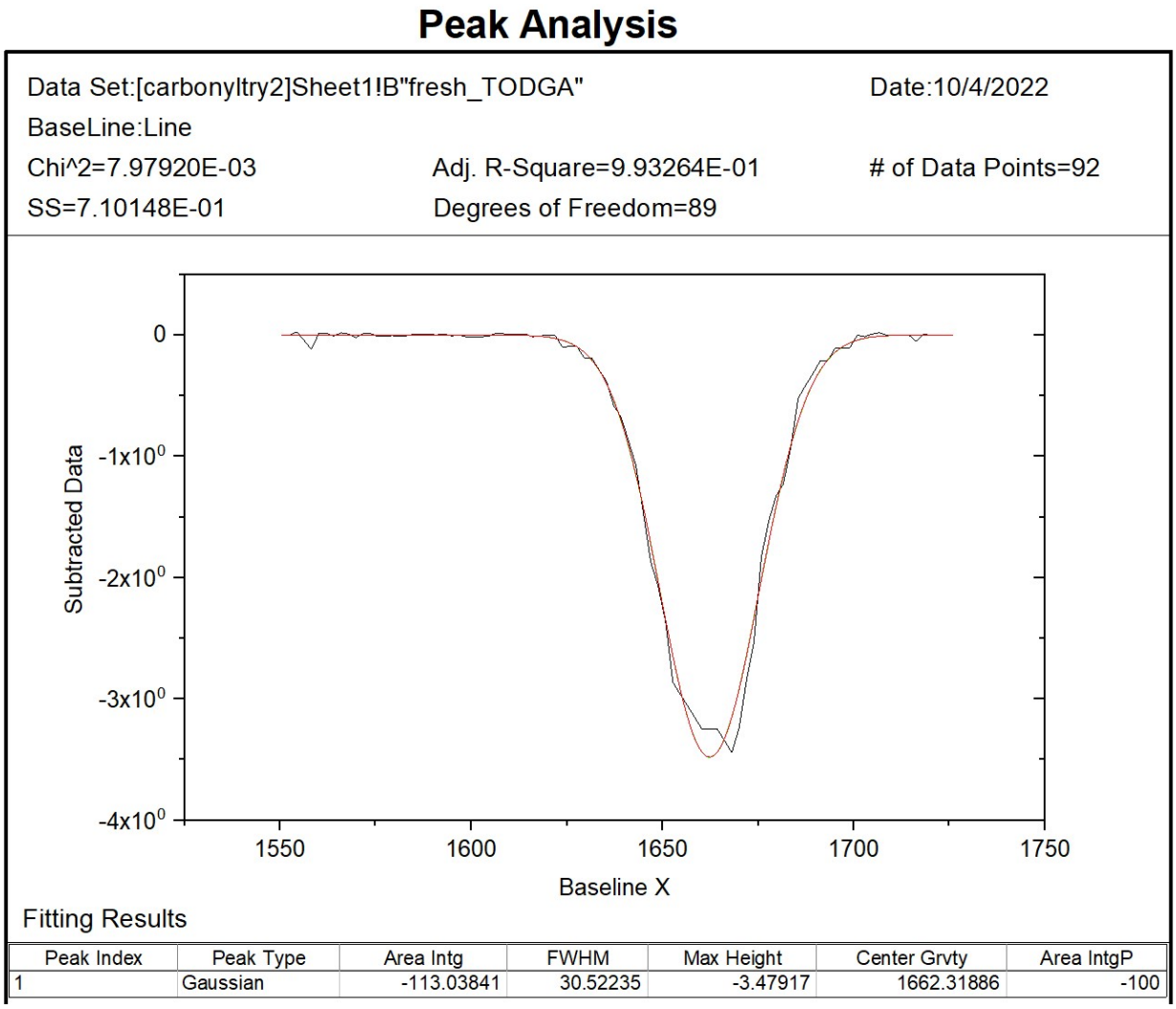


Figure S19. Results from fitting the carbonyl peaks after Ln contact for 1-dodecanol systems in OriginLab. Peak analysis yielded three peak properties, location (wavenumber), area, and FWHM.

OriginLab Carbonyl Spectra Peak Fits

No modifiers



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-113.03841	30.52235	-3.47917	1662.31886	-100

Figure S20. Peak analysis via OriginLab for 0.04 M of fresh TODGA in n-dodecane without phase modifier.

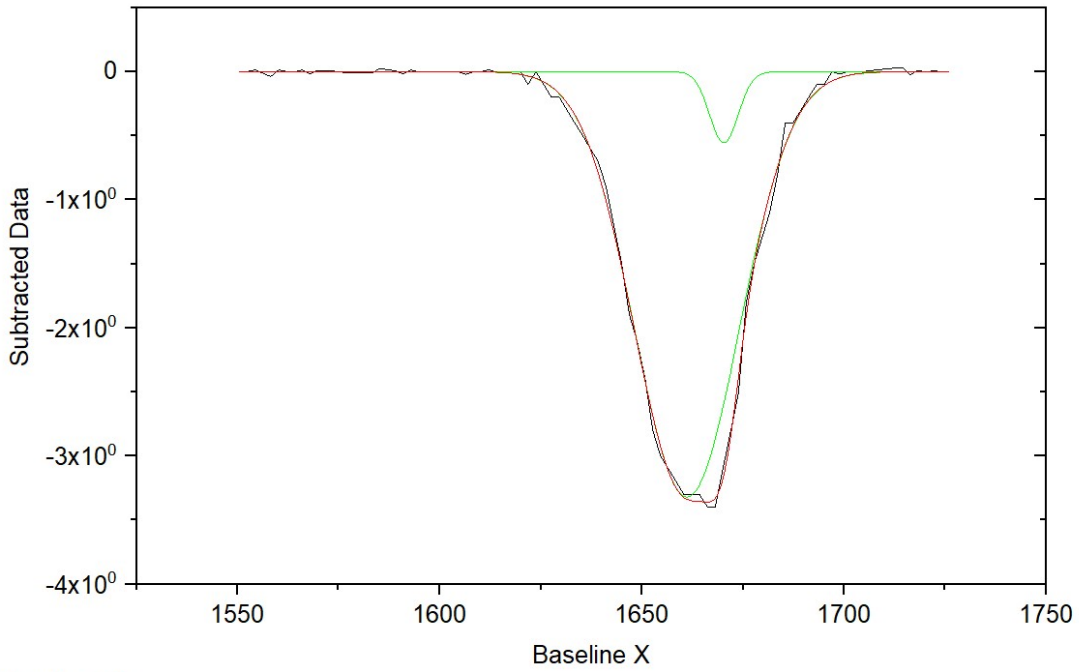
Peak Analysis

Data Set:[carbonyltry2]Sheet1!C"preeqm_TODGA" Date:10/4/2022

BaseLine:Line

Chi^2=2.40392E-03 Adj. R-Square=9.97984E-01 # of Data Points=92

SS=2.06737E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-107.84203	30.52369	-3.31909	1661.14153	-95.63584
2	Gaussian	-4.92117	8.32191	-0.55554	1670.28306	-4.36416

Figure S21. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 1 M HNO_3.

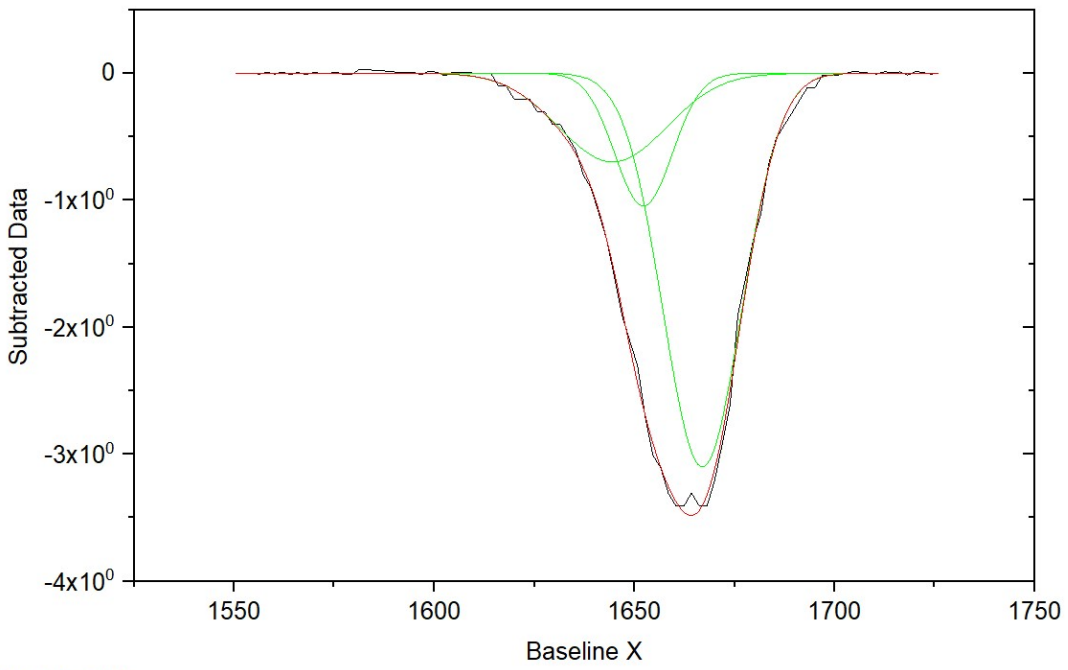
Peak Analysis

Data Set:[carbonyltry2]Sheet1!D"La" Date:10/4/2022

BaseLine:Line

Chi^2=2.61913E-03 Adj. R-Square=9.97852E-01 # of Data Points=92

SS=2.17388E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-75.99423	23.03552	-3.09921	1666.97455	-64.17701
2	Gaussian	-18.83929	16.95407	-1.0439	1652.26816	-15.90975
3	Gaussian	-23.57996	31.7393	-0.69793	1644.55537	-19.91324

Figure S22. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

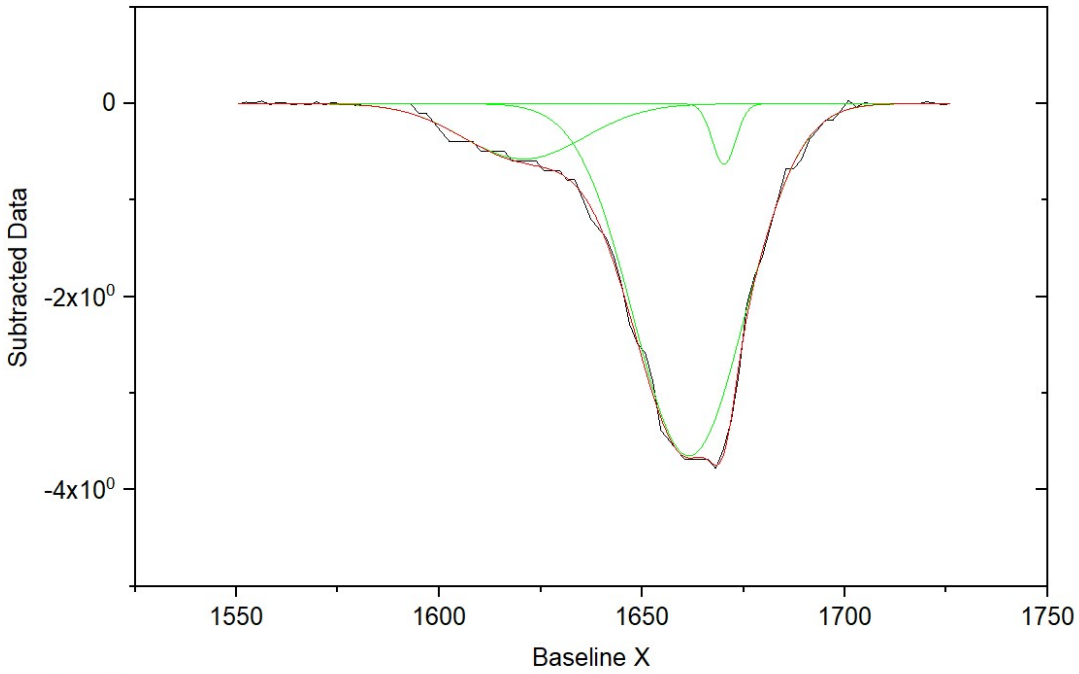
Peak Analysis

Data Set:[carbonyltry2]Sheet1!E"Ce" Date:10/4/2022

BaseLine:Line

Chi^2=3.11387E-03 Adj. R-Square=9.97792E-01 # of Data Points=92

SS=2.58451E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-125.18309	32.22155	-3.64979	1661.56617	-82.75029
2	Gaussian	-4.5282	6.76463	-0.62885	1670.18477	-2.99329
3	Gaussian	-21.56685	35.3475	-0.57319	1620.80756	-14.25642

Figure S23. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

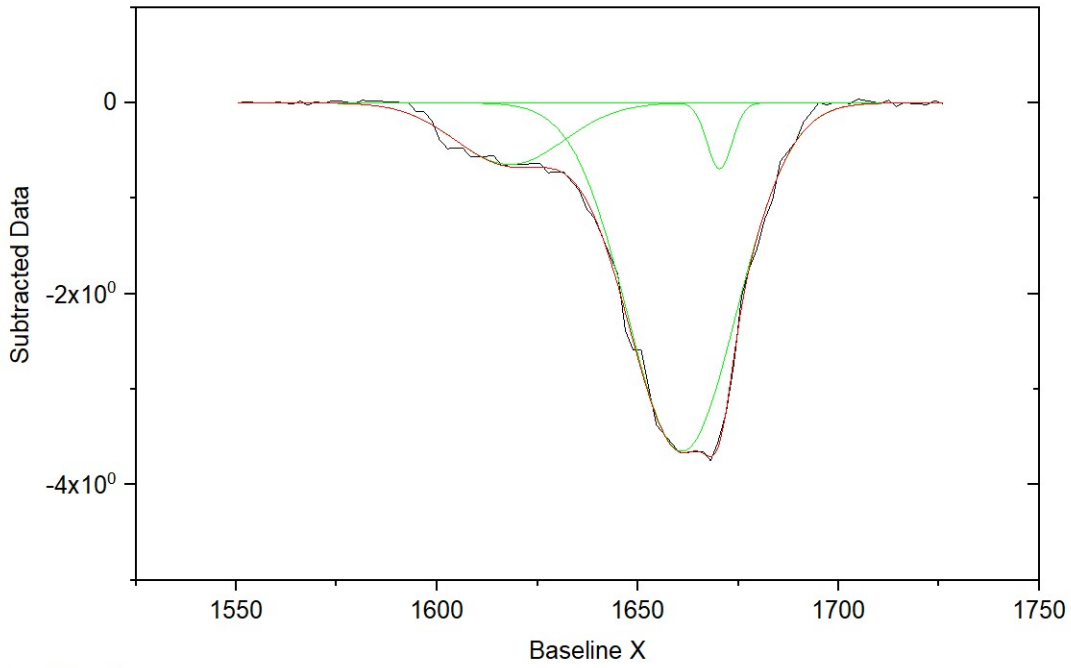
Peak Analysis

Data Set:[carbonyltry2]Sheet1!F"Pr" Date:10/4/2022

BaseLine:Line

Chi^2=4.48972E-03 Adj. R-Square=9.96813E-01 # of Data Points=92

SS=3.72646E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-123.86357	31.87363	-3.65073	1660.95783	-81.97501
2	Gaussian	-5.38053	7.3284	-0.68974	1670.36303	-3.56093
3	Gaussian	-21.85509	31.78722	-0.6459	1618.11616	-14.46407

Figure S24. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

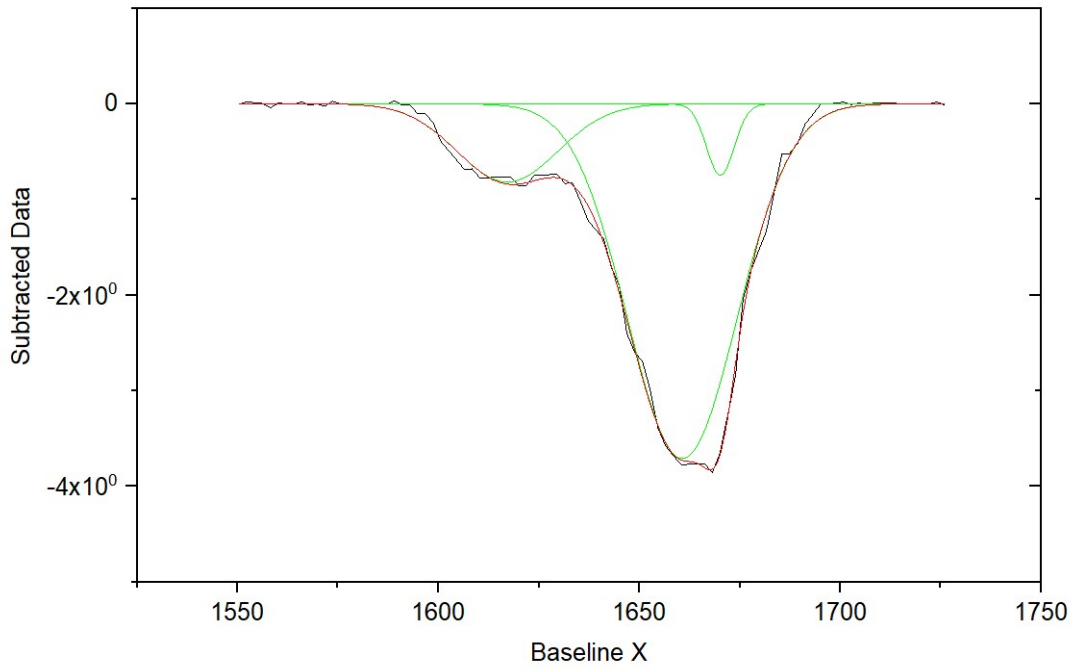
Peak Analysis

Data Set:[carbonyltry2]Sheet1!G"Nd" Date:10/4/2022

BaseLine:Line

Chi^2=5.14046E-03 Adj. R-Square=9.96506E-01 # of Data Points=92

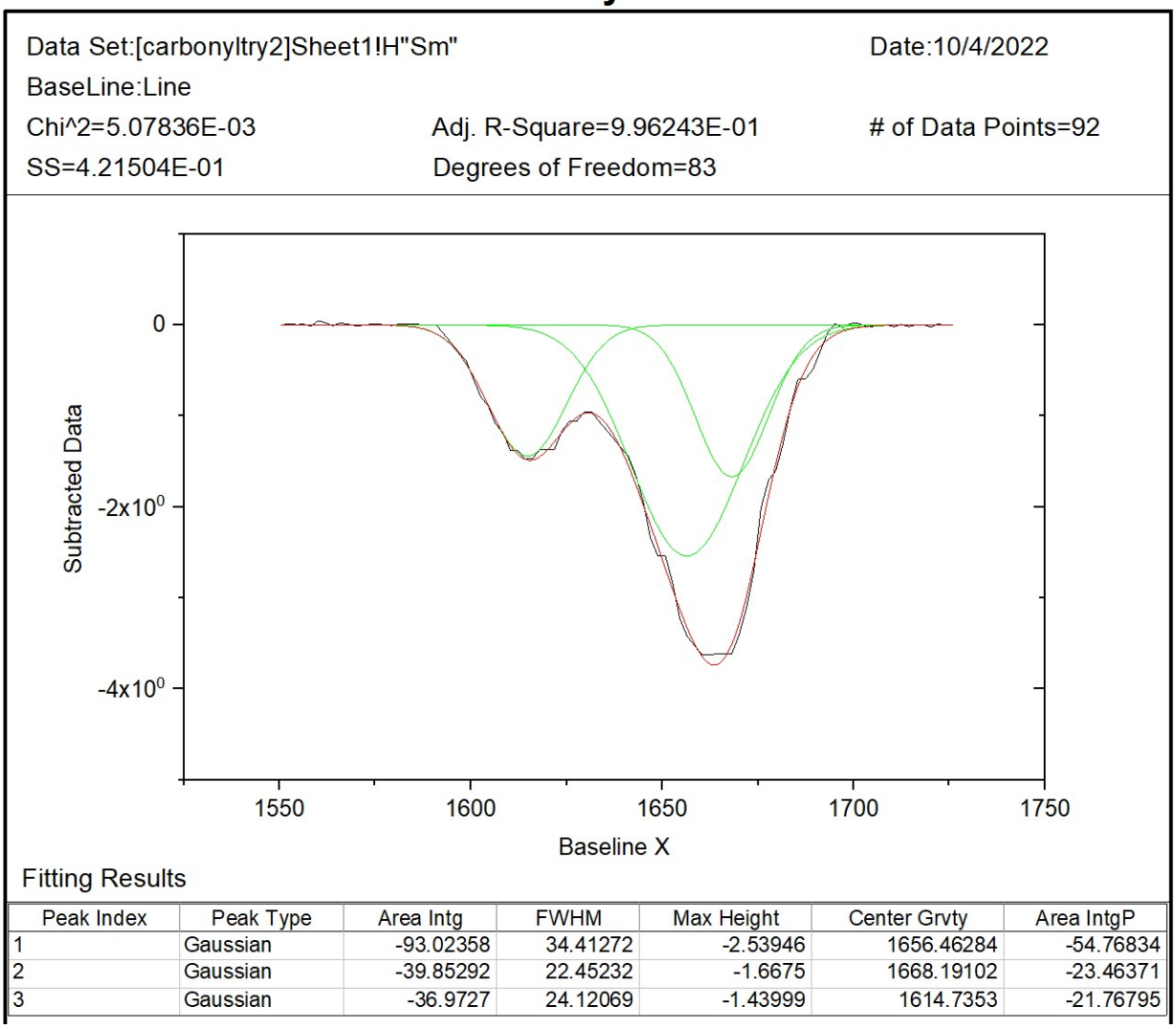
SS=4.26658E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-25.71971	29.59312	-0.81648	1617.17718	-16.21143
2	Gaussian	-126.48436	32.0314	-3.70962	1660.6927	-79.72452
3	Gaussian	-6.4477	8.10881	-0.74699	1670.16343	-4.06406

Figure S25. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-93.02358	34.41272	-2.53946	1656.46284	-54.76834
2	Gaussian	-39.85292	22.45232	-1.6675	1668.19102	-23.46371
3	Gaussian	-36.9727	24.12069	-1.43999	1614.7353	-21.76795

Figure S26. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

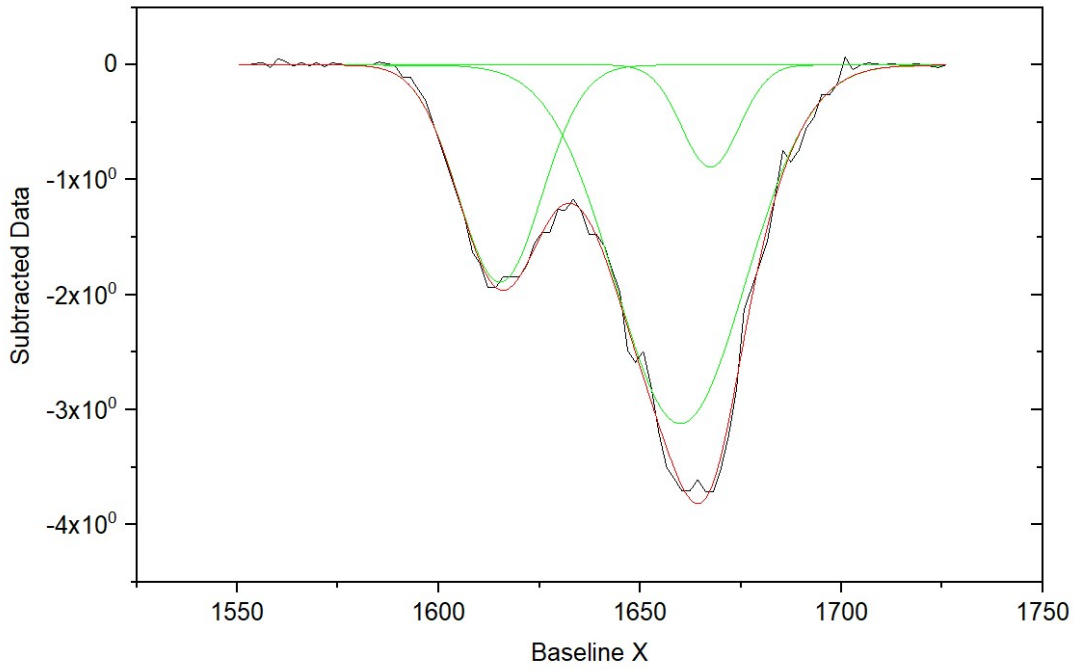
Peak Analysis

Data Set:[carbonyltry2]Sheet1!I"Eu" Date:10/4/2022

BaseLine:Line

Chi^2=7.29102E-03 Adj. R-Square=9.94940E-01 # of Data Points=92

SS=6.05154E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-48.89803	24.30375	-1.8901	1615.22373	-25.53755
2	Gaussian	-126.66351	38.11923	-3.12166	1660.00122	-66.15145
3	Gaussian	-15.9135	16.82141	-0.88873	1667.46606	-8.31101

Figure S27. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

Peak Analysis

Data Set:[carbonyltry2]Sheet1!J"Gd" Date:10/4/2022

BaseLine:Line

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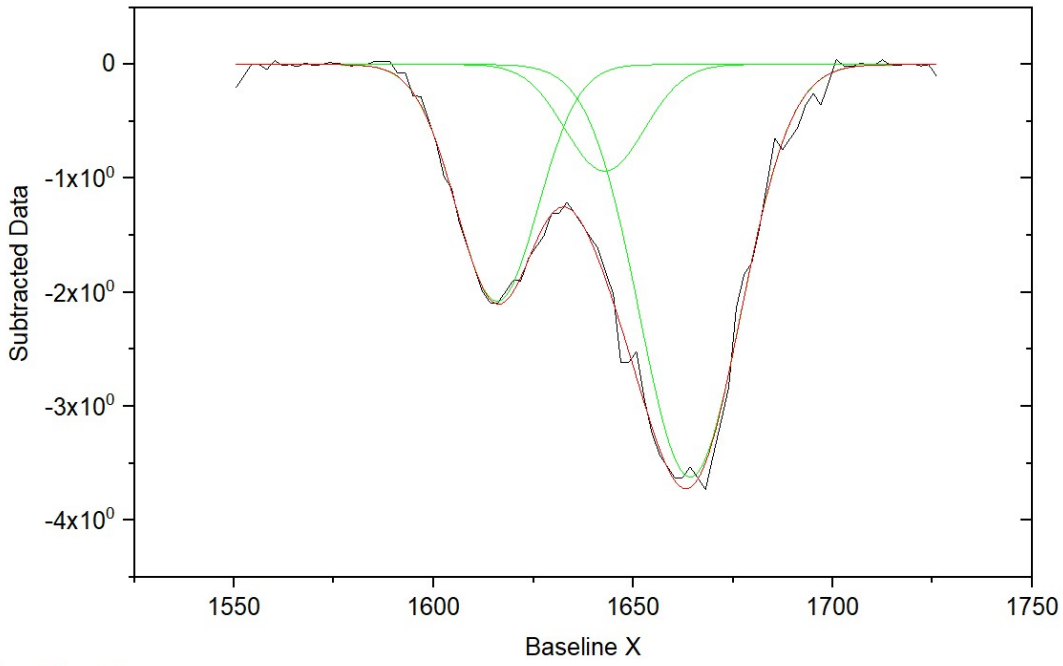
SS=7.93694E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-114.86979	29.79337	-3.62205	1664.27004	-60.02872
2	Gaussian	-53.15101	24.03814	-2.0772	1615.89523	-27.77568
3	Gaussian	-23.33727	23.41416	-0.93635	1642.88709	-12.1956

Figure S28. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.

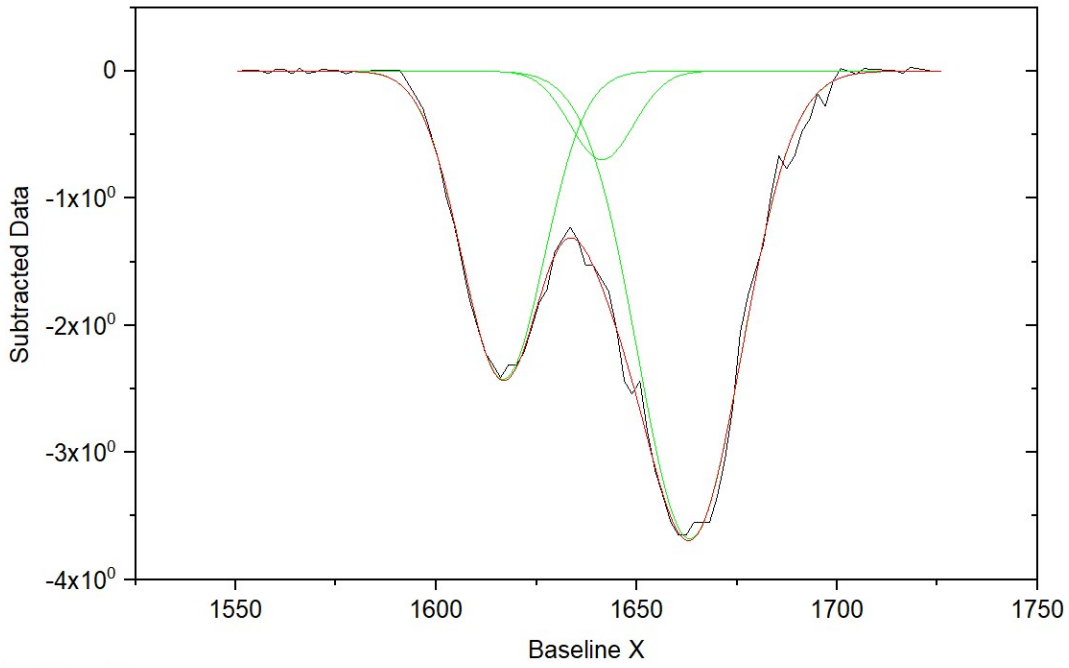
Peak Analysis

Data Set:[carbonyltry2]Sheet1!K"Tb" Date:10/4/2022

BaseLine:Line

Chi^2=6.62291E-03 Adj. R-Square=9.95461E-01 # of Data Points=92

SS=5.49702E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-62.1367	24.0849	-2.42366	1616.68564	-31.8966
2	Gaussian	-118.87863	30.36299	-3.67813	1663.20953	-61.02391
3	Gaussian	-13.79132	18.63079	-0.69541	1641.33332	-7.07949

Figure S29. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

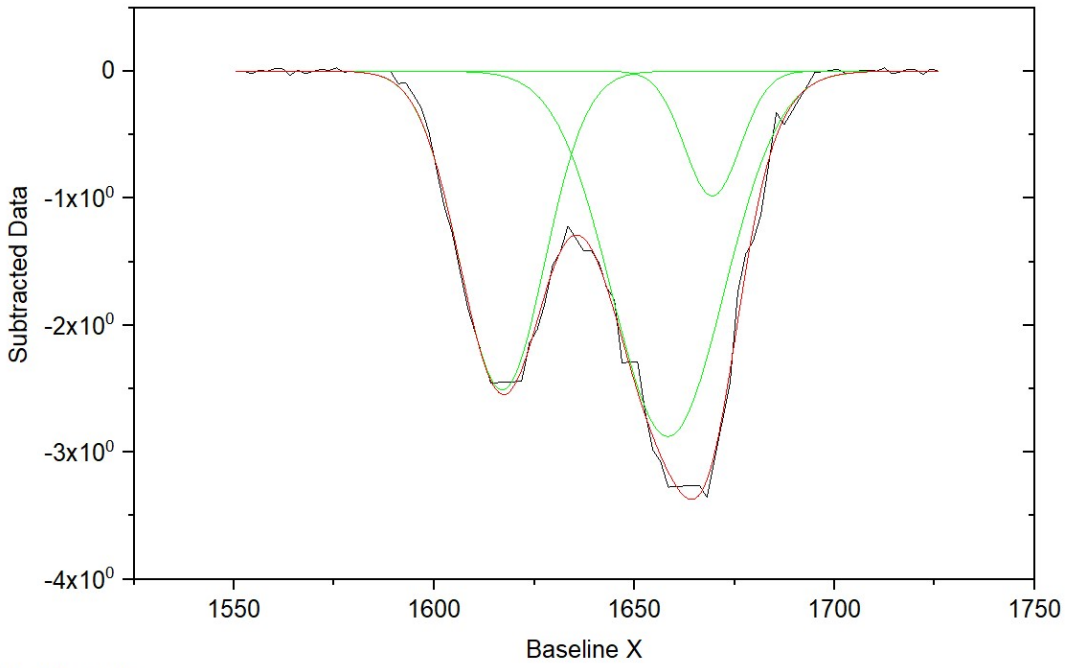
Peak Analysis

Data Set:[carbonyltry2]Sheet1!L"Dy" Date:10/4/2022

BaseLine:Line

Chi^2=5.84324E-03 Adj. R-Square=9.95611E-01 # of Data Points=92

SS=4.84989E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-66.10029	24.75089	-2.50888	1616.97754	-35.90638
2	Gaussian	-100.9021	32.96428	-2.87557	1658.36627	-54.81109
3	Gaussian	-17.08826	16.36097	-0.9812	1669.46282	-9.28253

Figure S30. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.

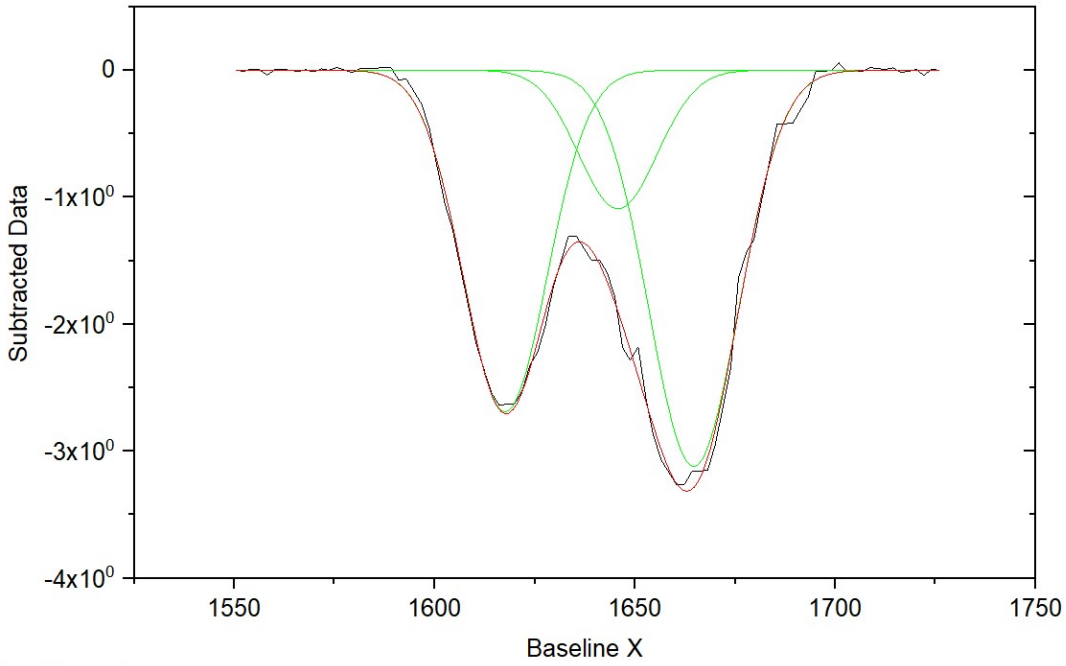
Peak Analysis

Data Set:[carbonyltry2]Sheet1!M"Ho" Date:10/4/2022

BaseLine:Line

Chi^2=5.64528E-03 Adj. R-Square=9.95713E-01 # of Data Points=92

SS=4.68559E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-70.41235	24.61171	-2.68766	1617.60658	-38.19621
2	Gaussian	-87.18038	26.26184	-3.11861	1664.67717	-47.29228
3	Gaussian	-26.75107	23.06479	-1.08958	1645.75773	-14.51151

Figure S31. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.

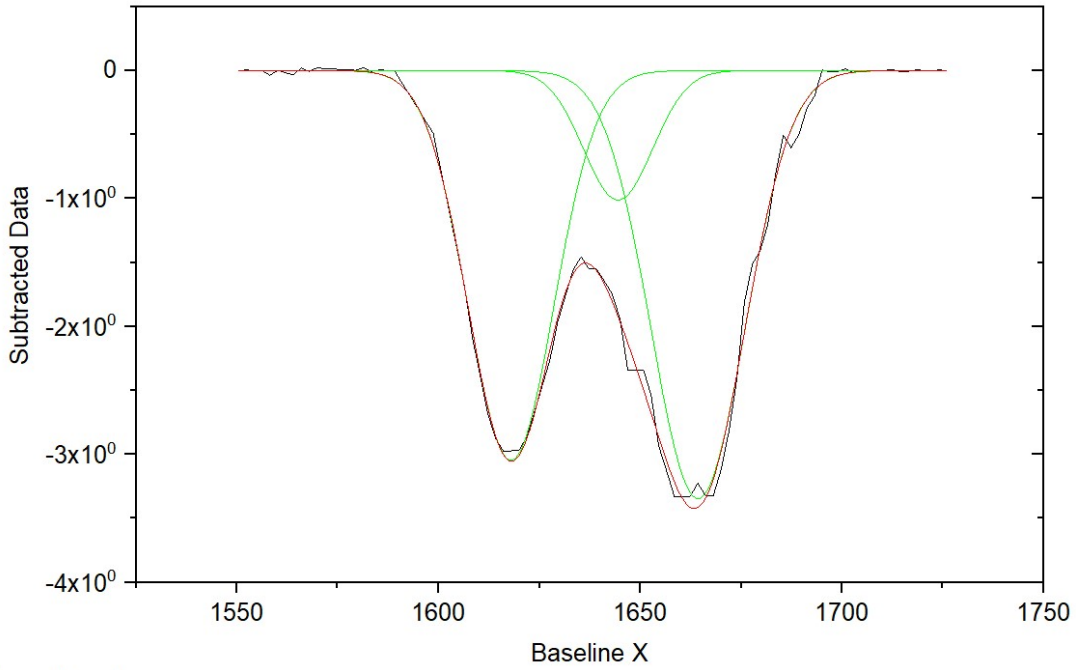
Peak Analysis

Data Set:[carbonyltry2]Sheet1!N"Er" Date:10/4/2022

BaseLine:Line

Chi^2=5.68279E-03 Adj. R-Square=9.96204E-01 # of Data Points=92

SS=4.71671E-01 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-81.10451	25.02037	-3.04522	1617.95068	-40.54916
2	Gaussian	-21.71276	20.17059	-1.01126	1644.51253	-10.85555
3	Gaussian	-97.19799	27.29461	-3.3454	1664.31622	-48.59529

Figure S32. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.

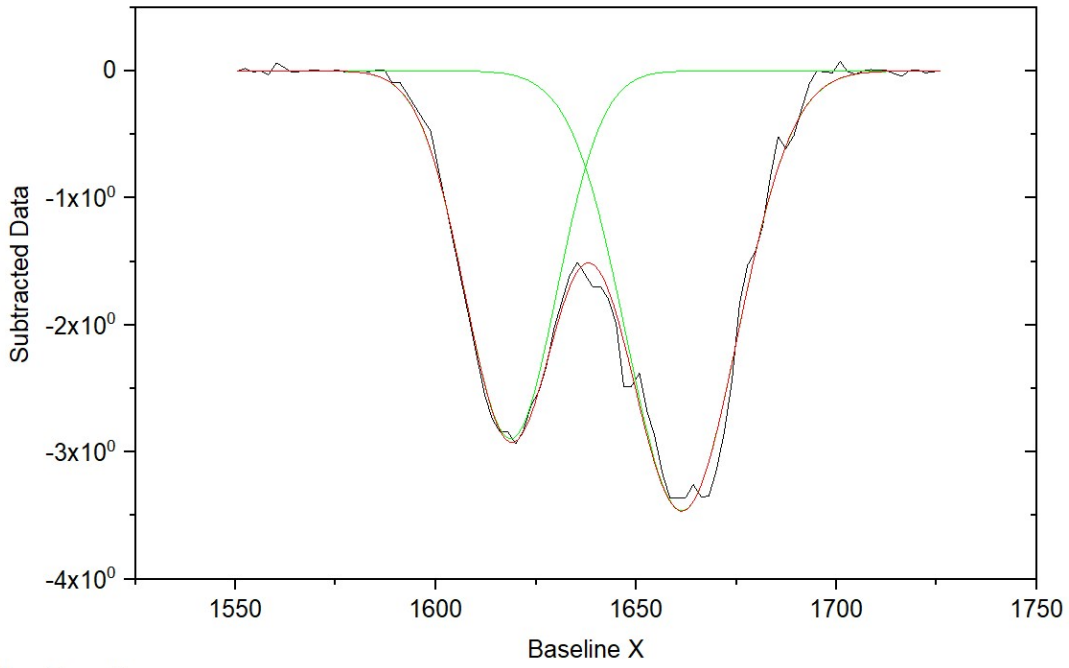
Peak Analysis

Data Set:[carbonyltry2]Sheet1!O"Tm" Date:10/4/2022

BaseLine:Line

Chi^2=1.15197E-02 Adj. R-Square=9.92341E-01 # of Data Points=92

SS=9.90691E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-82.73037	26.84889	-2.89472	1618.68471	-40.84388
2	Gaussian	-119.82232	32.5192	-3.46152	1661.41994	-59.15612

Figure S33. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.

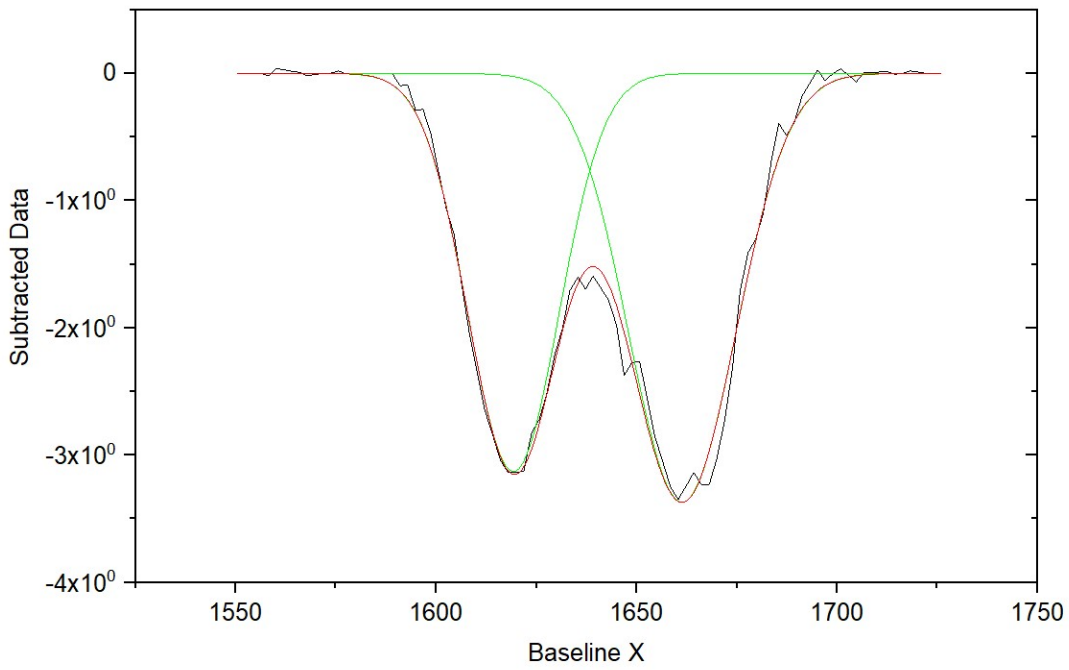
Peak Analysis

Data Set:[carbonyltry2]Sheet1!P"Yb" Date:10/4/2022

BaseLine:Line

Chi^2=1.15393E-02 Adj. R-Square=9.92474E-01 # of Data Points=92

SS=9.92376E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-88.82619	26.67671	-3.12807	1619.28047	-44.03662
2	Gaussian	-112.88364	31.48272	-3.36842	1661.37824	-55.96338

Figure S34. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.

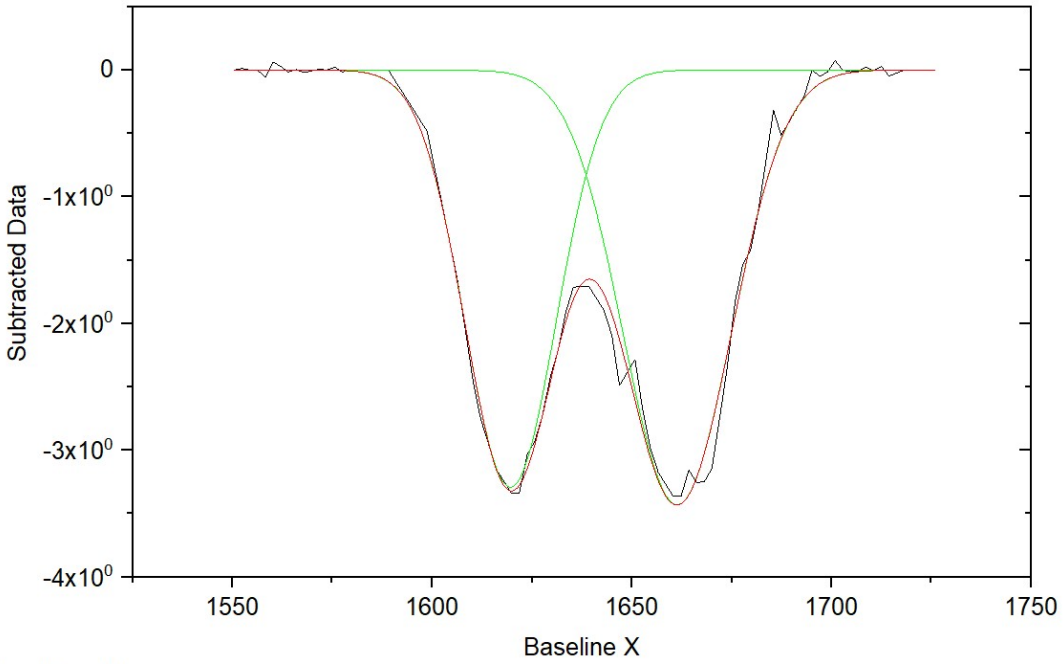
Peak Analysis

Data Set:[carbonyltry2]Sheet1!Q"Lu" Date:10/4/2022

BaseLine:Line

Chi^2=1.15210E-02 Adj. R-Square=9.92999E-01 # of Data Points=92

SS=9.90809E-01 Degrees of Freedom=86

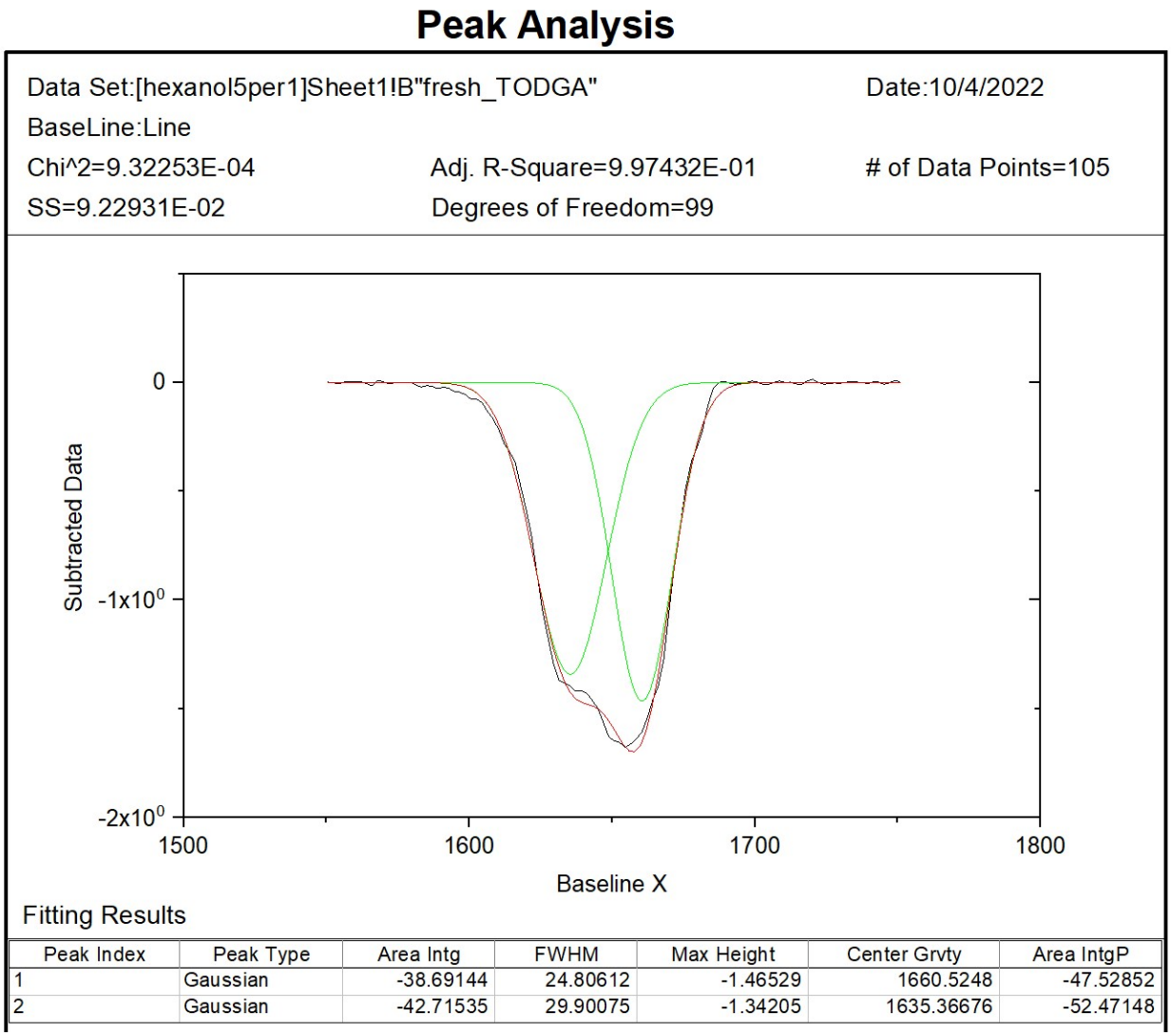


Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-94.10698	26.86457	-3.29086	1619.59009	-44.71027
2	Gaussian	-116.37483	31.88776	-3.42849	1661.3696	-55.28973

Figure S35. Peak analysis via OriginLab for 0.04 M TODGA in n-dodecane without phase modifier after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

5 vol% 1-hexanol



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-38.69144	24.80612	-1.46529	1660.5248	-47.52852
2	Gaussian	-42.71535	29.90075	-1.34205	1635.36676	-52.47148

Figure S36. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 5 vol% 1-hexanol in n-dodecane.

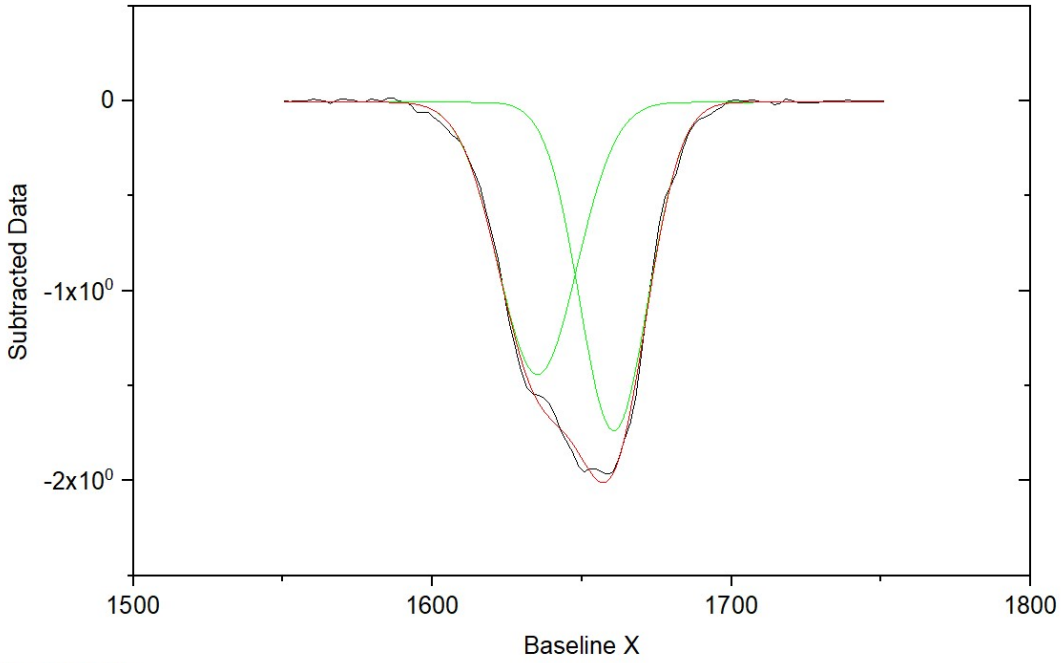
Peak Analysis

Data Set:[hexanol5per1]Sheet1!C"preeqm_TODGA" Date:10/4/2022

BaseLine:Line

Chi^2=9.99230E-04 Adj. R-Square=9.97978E-01 # of Data Points=105

SS=9.79245E-02 Degrees of Freedom=98



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-49.43873	26.84176	-1.73031	1660.67301	-51.15647
2	Gaussian	-47.20345	30.91988	-1.43418	1635.21634	-48.84353

Figure S37. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 1 M HNO_3.

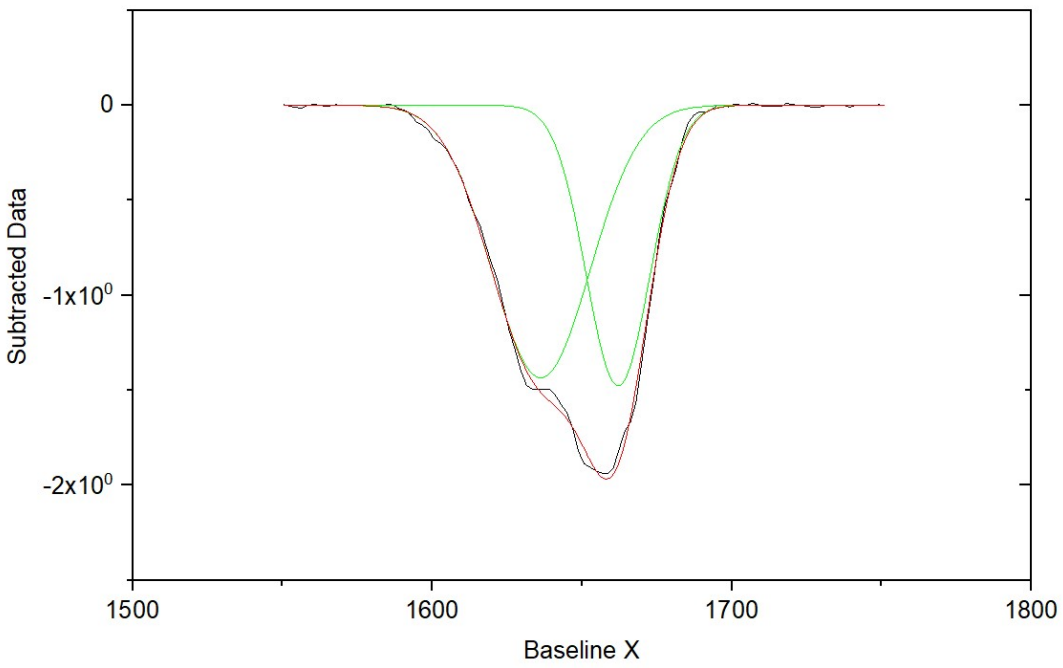
Peak Analysis

Data Set:[hexanol5per1]Sheet1!D"La" Date:10/4/2022

BaseLine:Line

Chi^2=8.39624E-04 Adj. R-Square=9.98190E-01 # of Data Points=105

SS=8.31228E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-59.00301	38.63394	-1.43474	1636.28952	-59.98803
2	Gaussian	-39.35496	25.04573	-1.47616	1662.10729	-40.01197

Figure S38. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

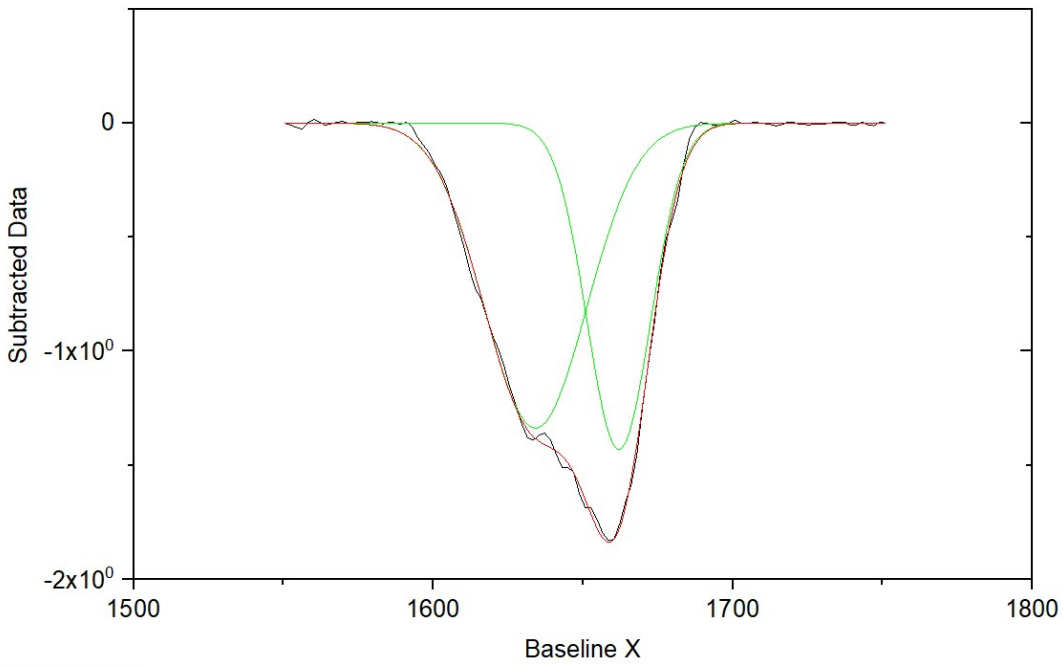
Peak Analysis

Data Set:[hexanol5per1]Sheet1!E"Ce" Date:10/4/2022

BaseLine:Line

Chi^2=7.19237E-04 Adj. R-Square=9.98237E-01 # of Data Points=105

SS=7.12044E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-57.205	40.16675	-1.33794	1634.17632	-59.98792
2	Gaussian	-38.15587	25.04719	-1.4311	1662.03547	-40.01208

Figure S39. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

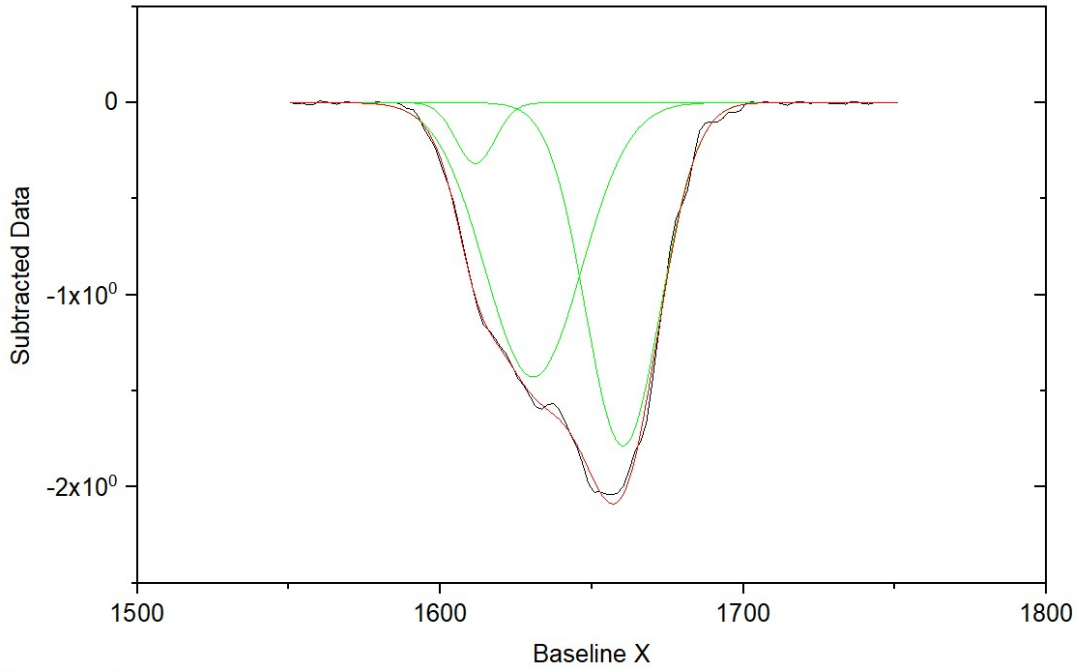
Peak Analysis

Data Set:[hexanol5per1]Sheet1!F"Pr" Date:10/4/2022

BaseLine:Line

Chi^2=8.69722E-04 Adj. R-Square=9.98417E-01 # of Data Points=105

SS=8.34933E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-57.01513	37.52233	-1.42747	1630.69301	-48.67086
2	Gaussian	-55.01254	28.95238	-1.78503	1660.28678	-46.96135
3	Gaussian	-5.11661	15.22971	-0.31562	1611.60451	-4.36779

Figure S40. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

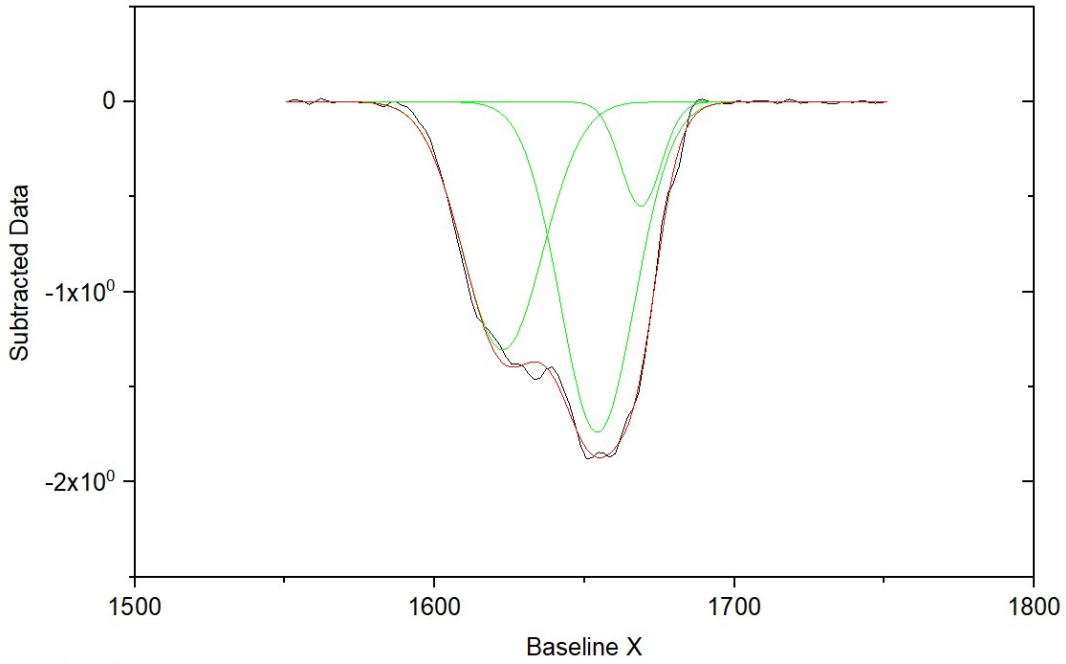
Peak Analysis

Data Set:[hexanol5per1]Sheet1!G"Nd" Date:10/4/2022

BaseLine:Line

Chi^2=1.24262E-03 Adj. R-Square=9.97369E-01 # of Data Points=105

SS=1.19292E-01 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-43.61843	31.3759	-1.306	1622.75664	-40.76738
2	Gaussian	-54.13714	29.23819	-1.73945	1654.3399	-50.59855
3	Gaussian	-9.23789	15.81969	-0.54858	1668.8237	-8.63407

Figure S41. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.

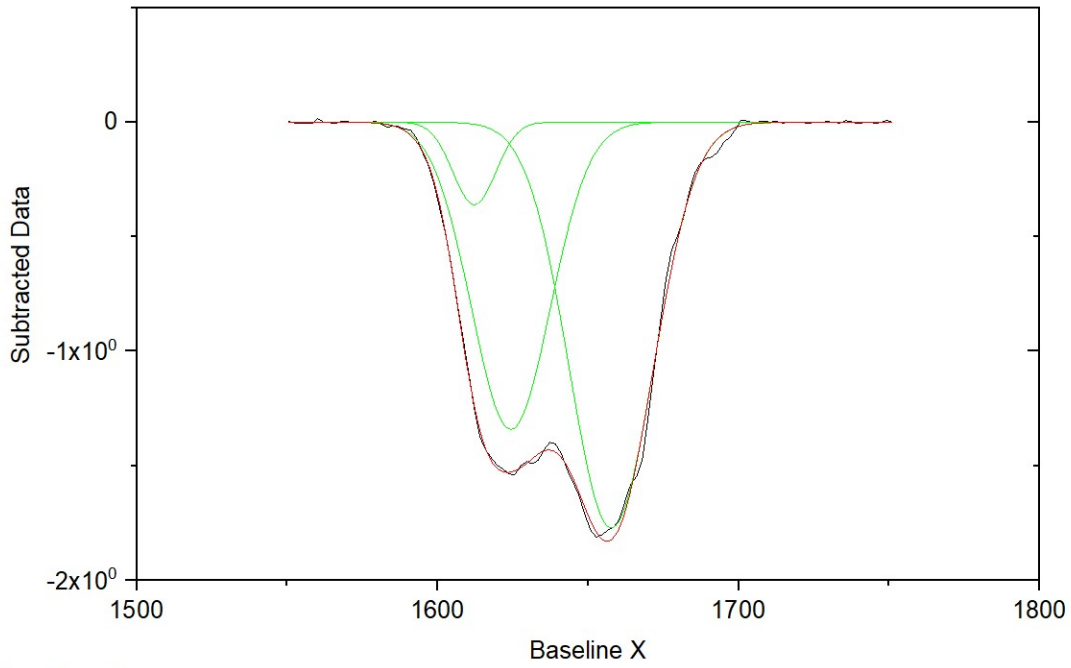
Peak Analysis

Data Set:[hexanol5per1]Sheet1!H"Sm" Date:10/4/2022

BaseLine:Line

Chi^2=7.10687E-04 Adj. R-Square=9.98497E-01 # of Data Points=105

SS=6.82260E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-6.42463	16.75984	-0.36012	1612.22068	-5.70797
2	Gaussian	-44.0044	30.81389	-1.34158	1624.34841	-39.09576
3	Gaussian	-62.1264	32.93279	-1.77221	1657.73761	-55.19627

Figure S42. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

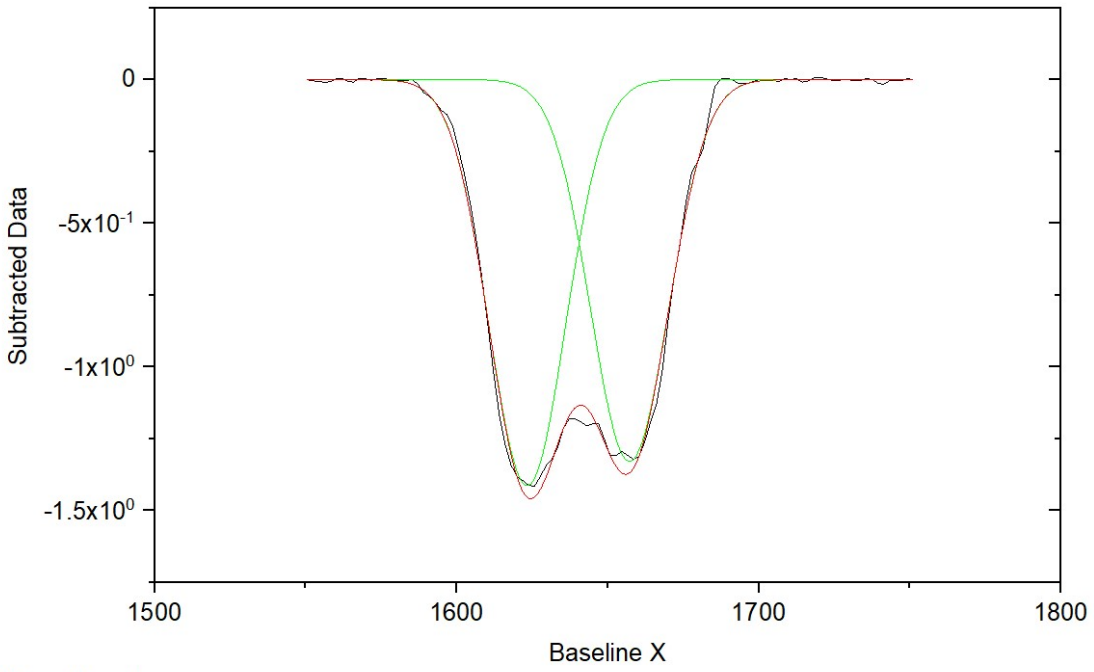
Peak Analysis

Data Set:[hexanol5per1]Sheet1!I"Eu" Date:10/4/2022

BaseLine:Line

Chi^2=1.01670E-03 Adj. R-Square=9.96738E-01 # of Data Points=105

SS=1.00653E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-44.96847	29.88571	-1.41355	1623.37476	-51.28317
2	Gaussian	-42.71814	30.19758	-1.32895	1657.26152	-48.71683

Figure 43. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

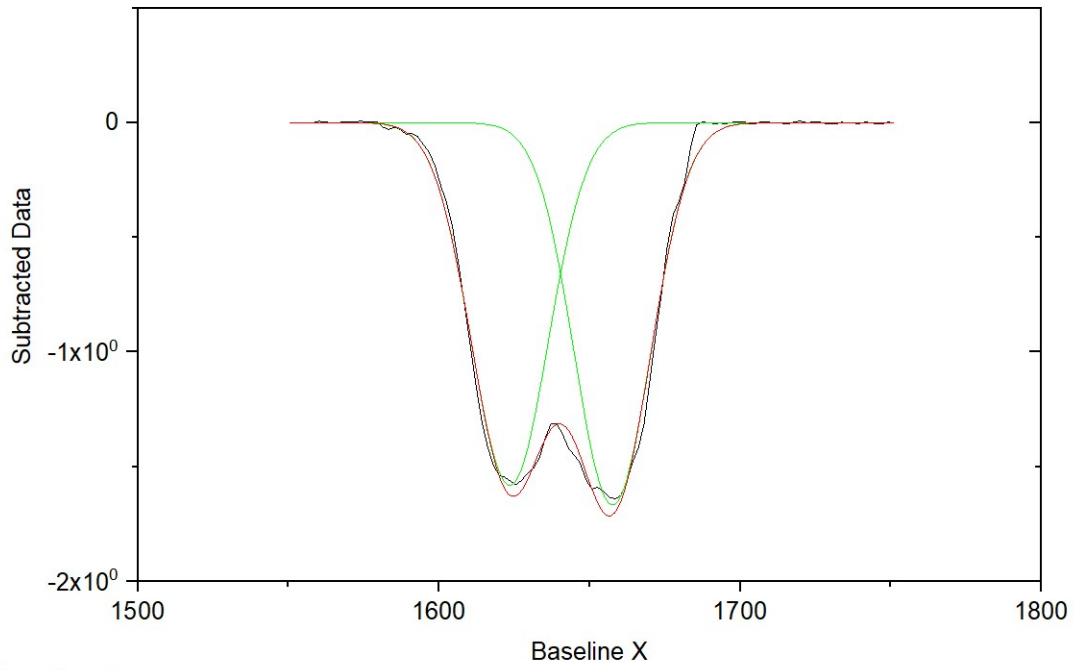
Peak Analysis

Data Set:[hexanol5per1]Sheet1!J"Gd" Date:10/4/2022

BaseLine:Line

Chi^2=1.81935E-03 Adj. R-Square=9.95806E-01 # of Data Points=105

SS=1.80115E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-50.50987	29.99294	-1.58207	1623.52712	-48.92263
2	Gaussian	-52.73451	29.71056	-1.66745	1657.64483	-51.07737

Figure S44. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.

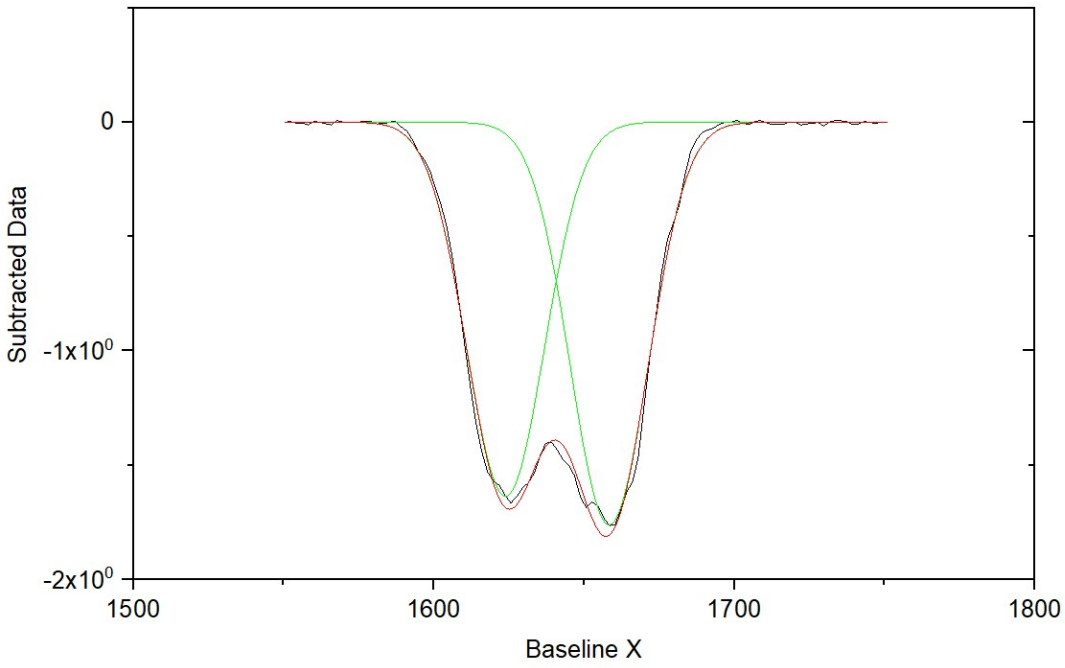
Peak Analysis

Data Set:[hexanol5per1]Sheet1!K"Tb" Date:10/4/2022

BaseLine:Line

Chi^2=1.36792E-03 Adj. R-Square=9.97141E-01 # of Data Points=105

SS=1.35424E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-52.95949	30.39098	-1.63707	1623.90632	-48.12374
2	Gaussian	-57.08909	30.4483	-1.7614	1658.41117	-51.87626

Figure S45. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

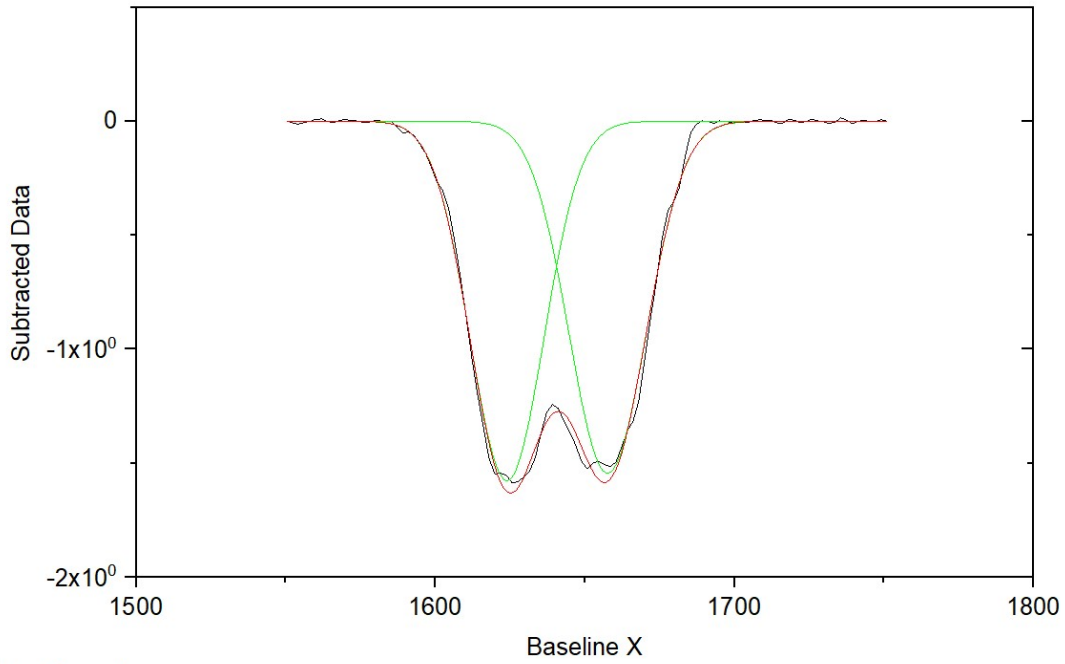
Peak Analysis

Data Set:[hexanol5per1]Sheet1!L"Dy" Date:10/4/2022

BaseLine:Line

Chi^2=1.34496E-03 Adj. R-Square=9.96621E-01 # of Data Points=105

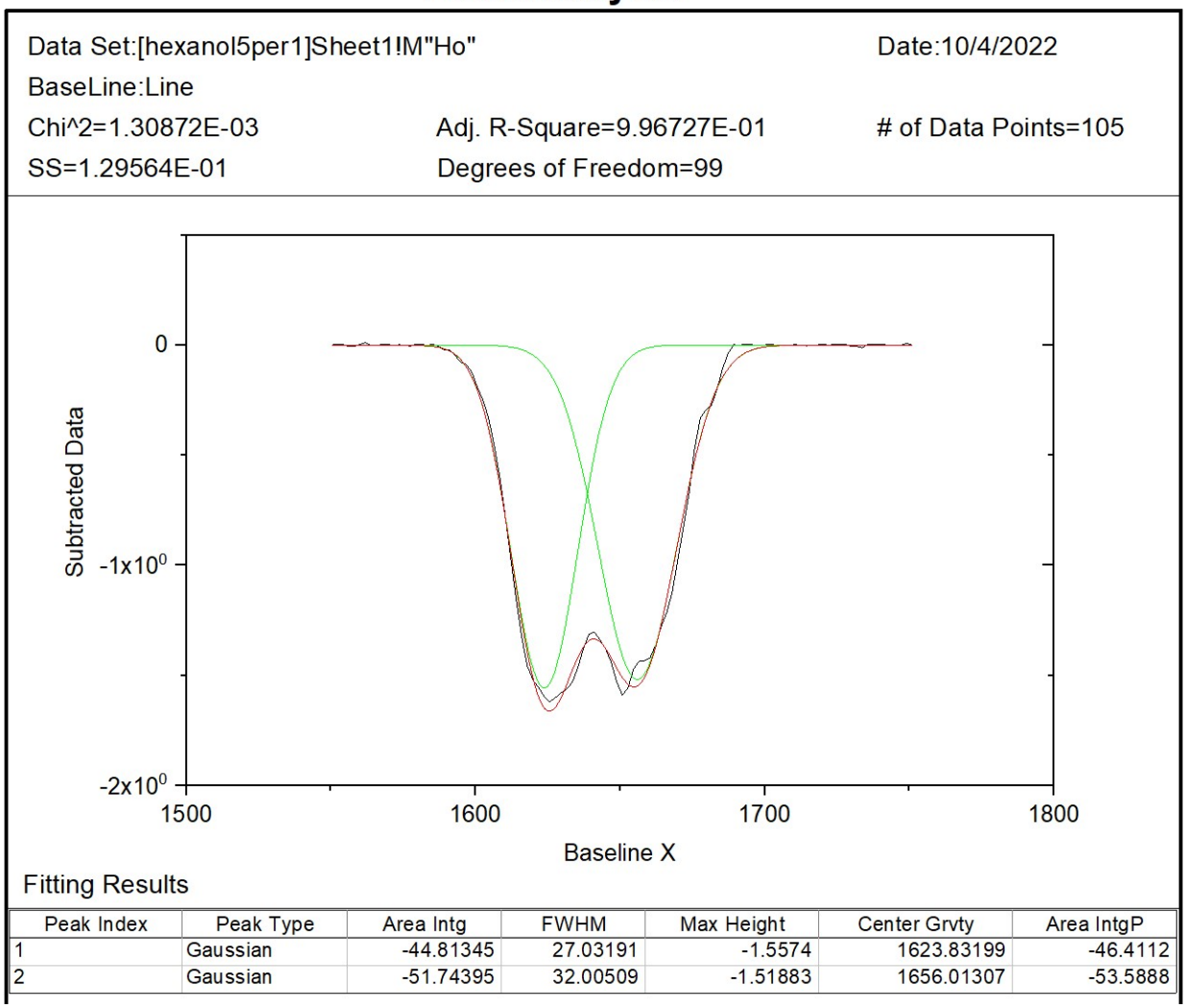
SS=1.33151E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-48.66375	28.99321	-1.5768	1623.98277	-49.4949
2	Gaussian	-49.65698	30.20971	-1.54419	1657.64288	-50.5051

Figure S46. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-44.81345	27.03191	-1.5574	1623.83199	-46.4112
2	Gaussian	-51.74395	32.00509	-1.51883	1656.01307	-53.5888

Figure S47. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.

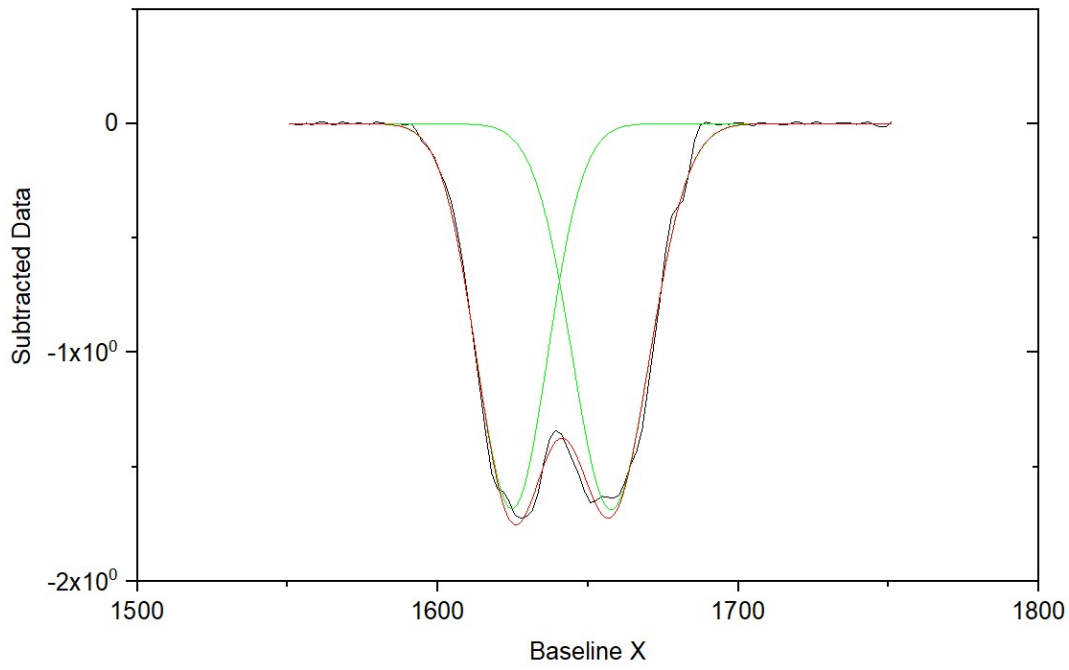
Peak Analysis

Data Set:[hexanol5per1]Sheet1!N"Er" Date:10/4/2022

BaseLine:Line

Chi^2=1.61340E-03 Adj. R-Square=9.96505E-01 # of Data Points=105

SS=1.59726E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-49.83778	27.80419	-1.6839	1624.7177	-47.89088
2	Gaussian	-54.22751	30.19047	-1.6874	1657.66604	-52.10912

Figure S48. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.

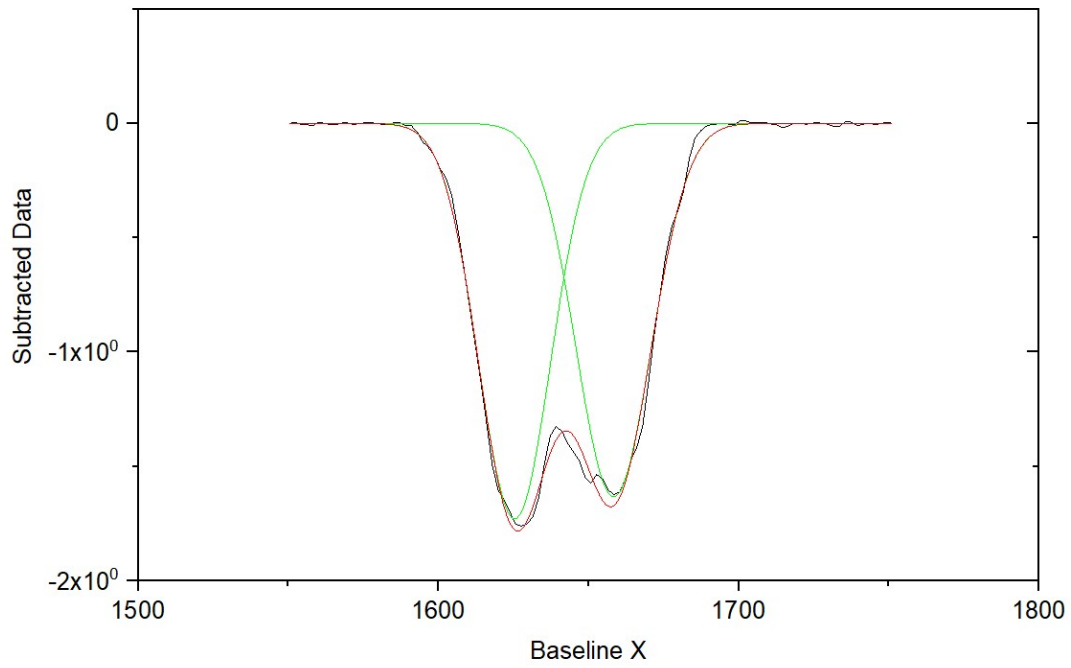
Peak Analysis

Data Set:[hexanol5per1]Sheet1!O"Tm" Date:10/4/2022

BaseLine:Line

Chi^2=1.25897E-03 Adj. R-Square=9.97217E-01 # of Data Points=105

SS=1.24638E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-51.91488	28.1835	-1.73047	1625.39546	-50.48979
2	Gaussian	-50.90764	29.26478	-1.6342	1658.38999	-49.51021

Figure S49. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.

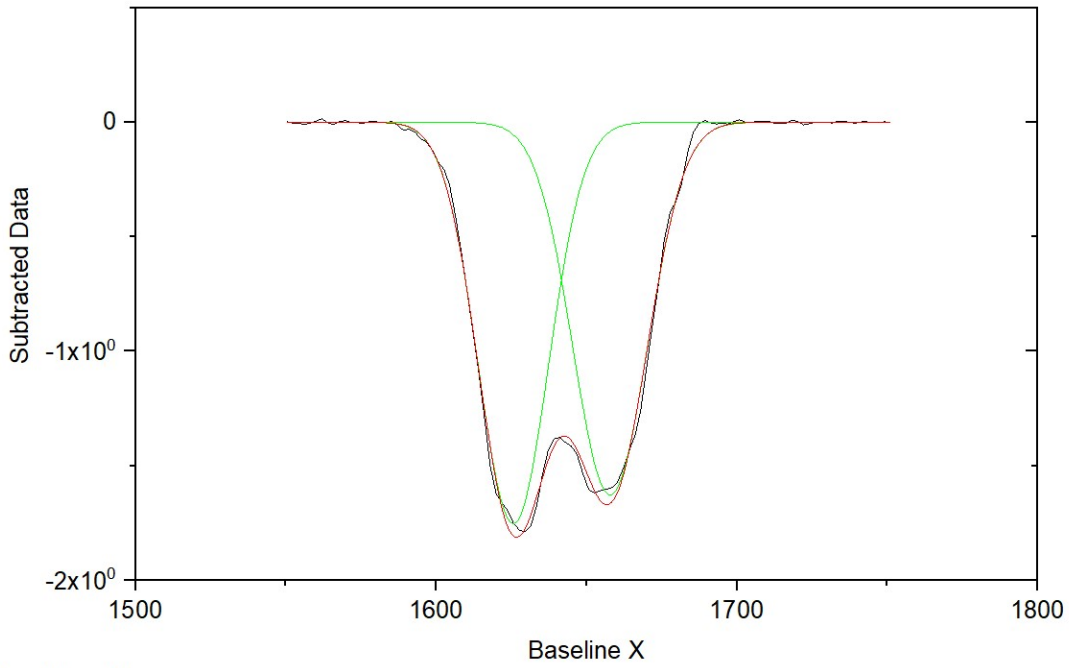
Peak Analysis

Data Set:[hexanol5per1]Sheet1!P"Yb" Date:10/4/2022

BaseLine:Line

Chi^2=1.07779E-03 Adj. R-Square=9.97640E-01 # of Data Points=105

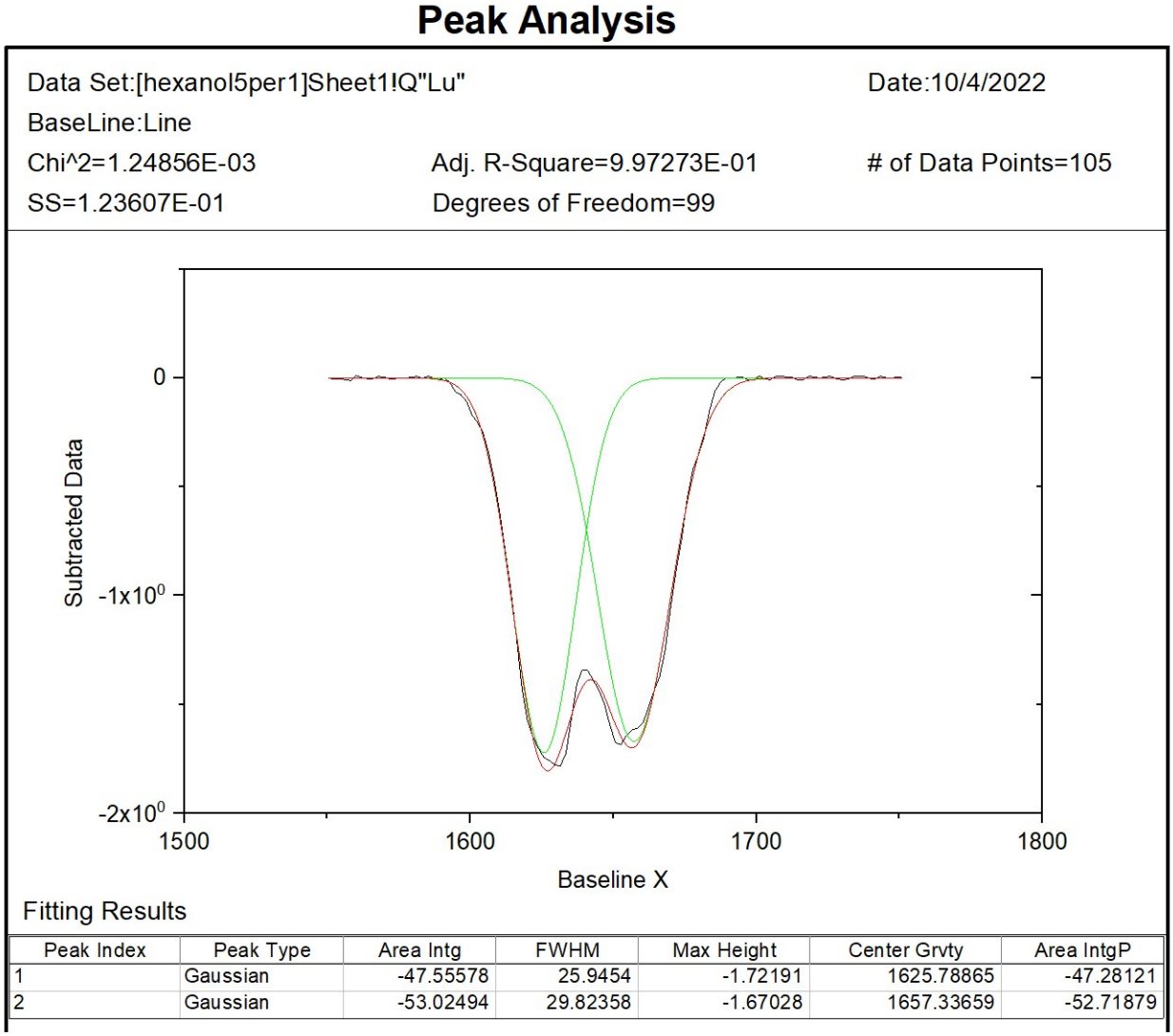
SS=1.06701E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-51.34315	27.50562	-1.75359	1625.68671	-50.49973
2	Gaussian	-50.327	29.0462	-1.62772	1657.86966	-49.50027

Figure S50. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-47.55578	25.9454	-1.72191	1625.78865	-47.28121
2	Gaussian	-53.02494	29.82358	-1.67028	1657.33659	-52.71879

Figure S51. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-hexanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

30 vol% 1-hexanol

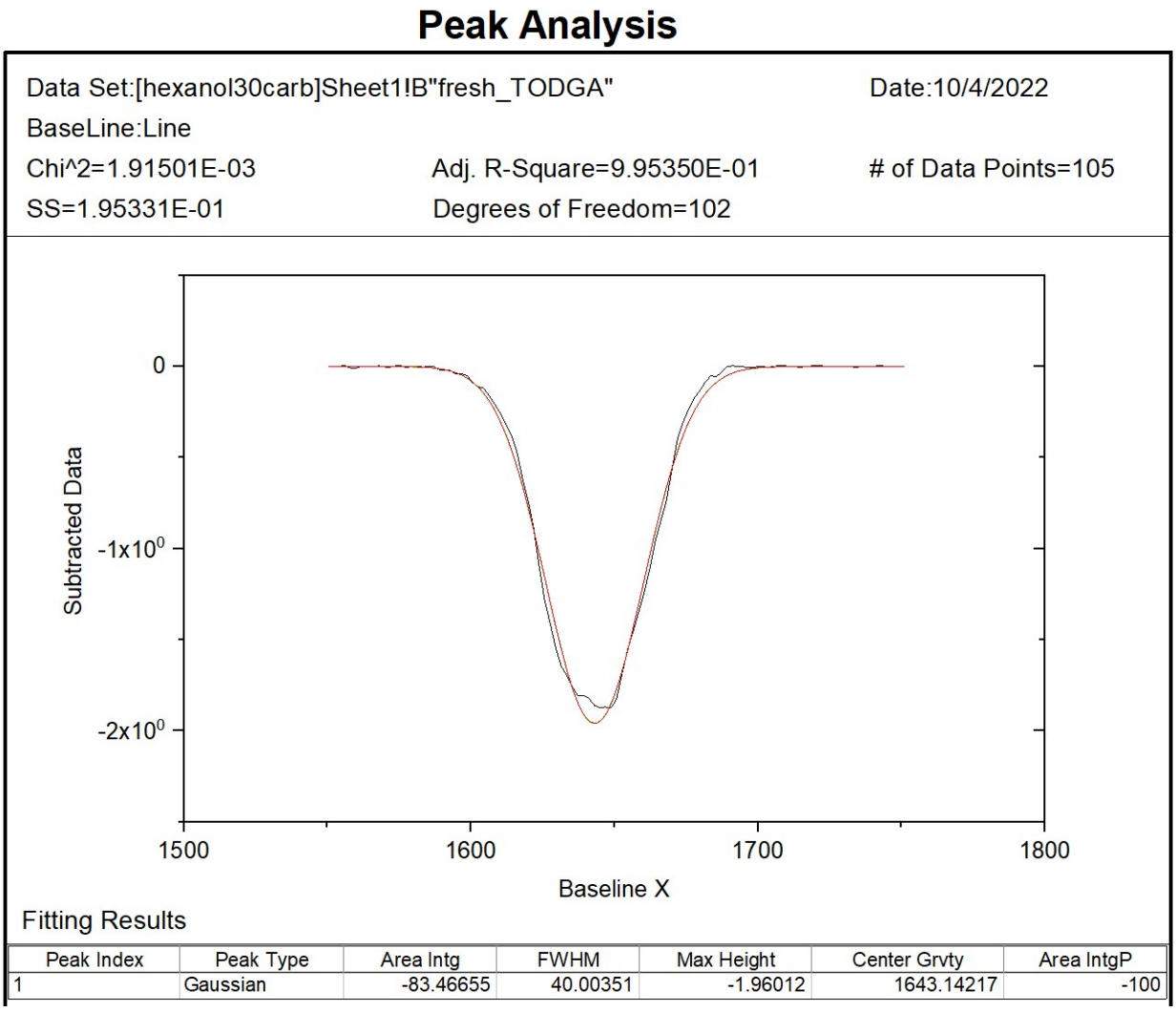
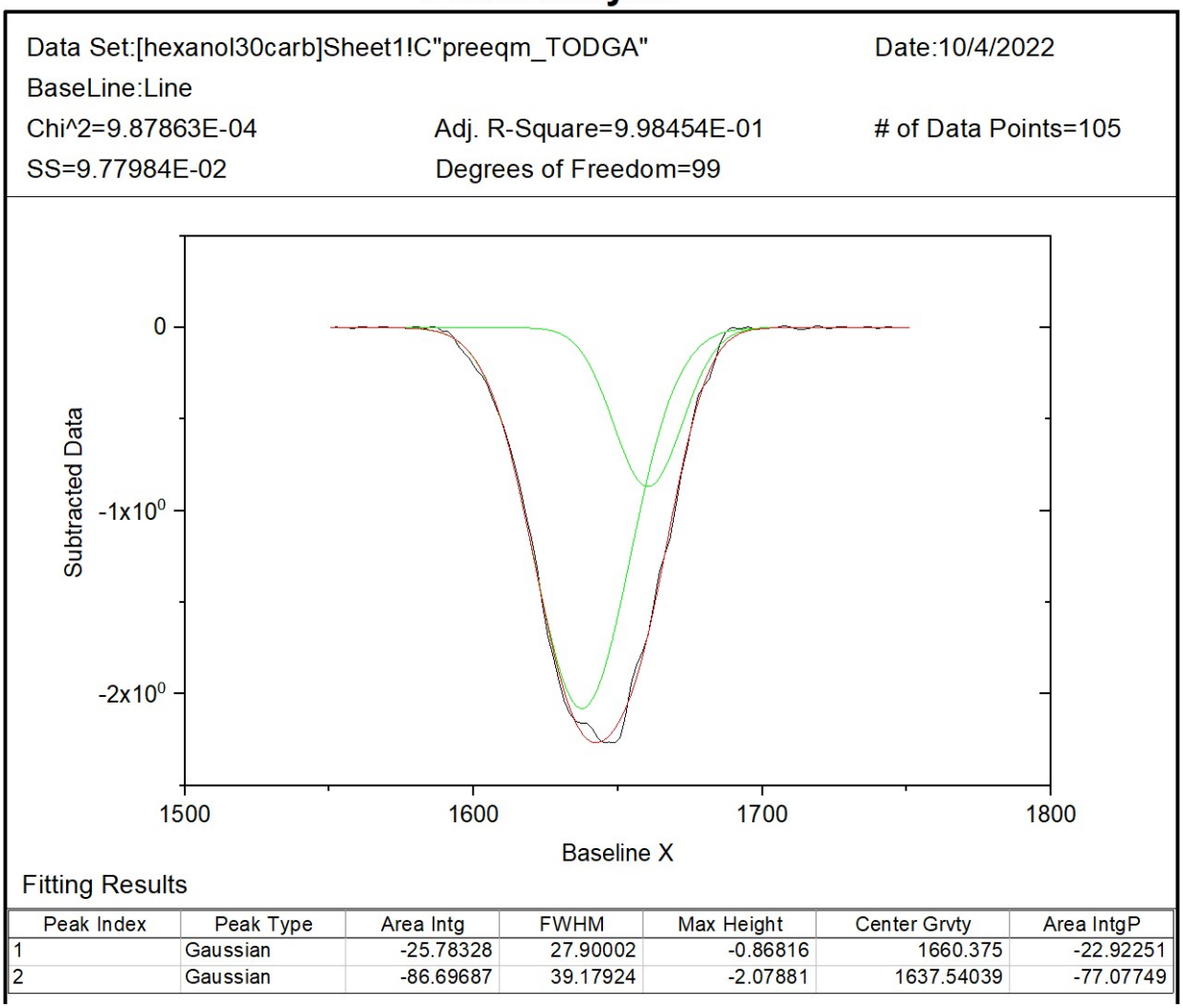


Figure S52. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 30 vol% 1-hexanol in n-dodecane.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-25.78328	27.90002	-0.86816	1660.375	-22.92251
2	Gaussian	-86.69687	39.17924	-2.07881	1637.54039	-77.07749

Figure S53. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 1 M HNO_3.

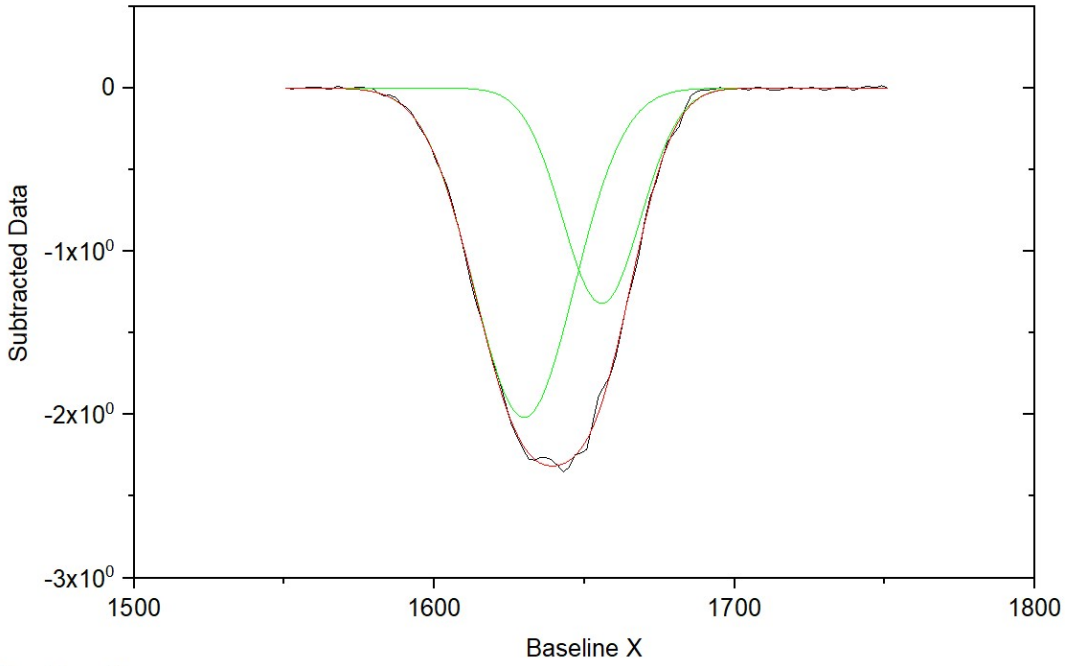
Peak Analysis

Data Set:[hexanol30carb]Sheet1!D"La" Date:10/4/2022

BaseLine:Line

Chi^2=5.65969E-04 Adj. R-Square=9.99222E-01 # of Data Points=105

SS=5.60310E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-84.44898	39.34672	-2.01629	1629.92836	-66.30571
2	Gaussian	-42.91409	30.5518	-1.31957	1655.73469	-33.69429

Figure S54. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

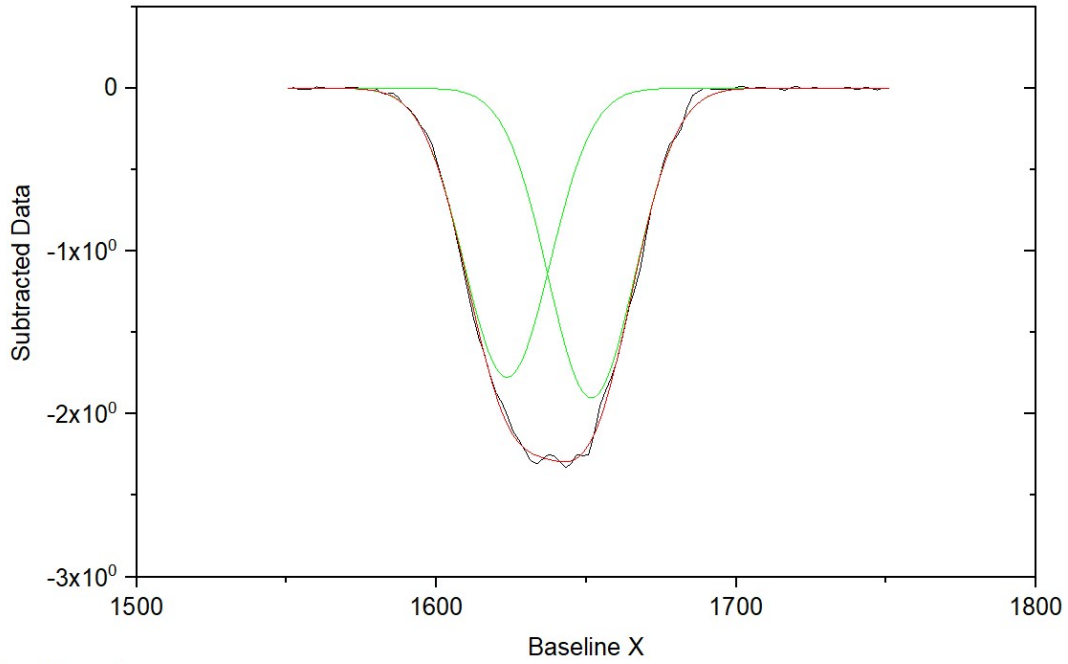
Peak Analysis

Data Set:[hexanol30carb]Sheet1!E"Ce" Date:10/4/2022

BaseLine:Line

Chi^2=8.41861E-04 Adj. R-Square=9.98897E-01 # of Data Points=105

SS=8.33443E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-63.74594	33.76411	-1.77364	1623.57402	-48.05829
2	Gaussian	-68.89703	34.05848	-1.90039	1651.72089	-51.94171

Figure S55. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

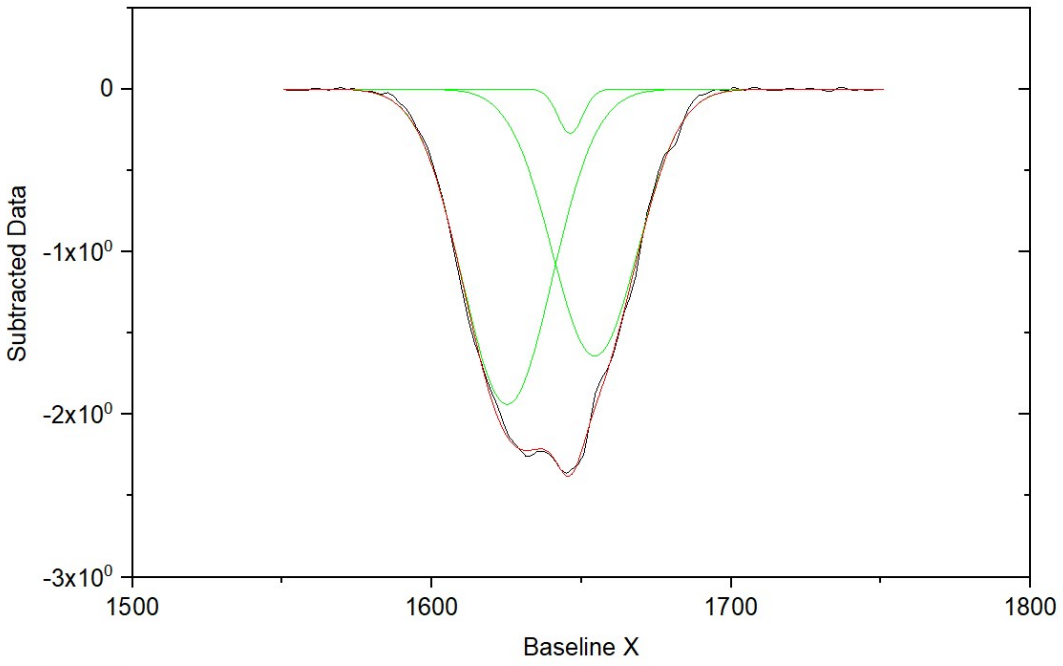
Peak Analysis

Data Set:[hexanol30carb]Sheet1!F"Pr" Date:10/4/2022

BaseLine:Line

Chi^2=8.54147E-04 Adj. R-Square=9.98874E-01 # of Data Points=105

SS=8.19981E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-72.47689	35.15091	-1.93701	1625.19735	-54.08677
2	Gaussian	-2.80086	9.6854	-0.27167	1646.2616	-2.09018
3	Gaussian	-58.72339	33.63469	-1.64018	1654.50503	-43.82305

Figure S56. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

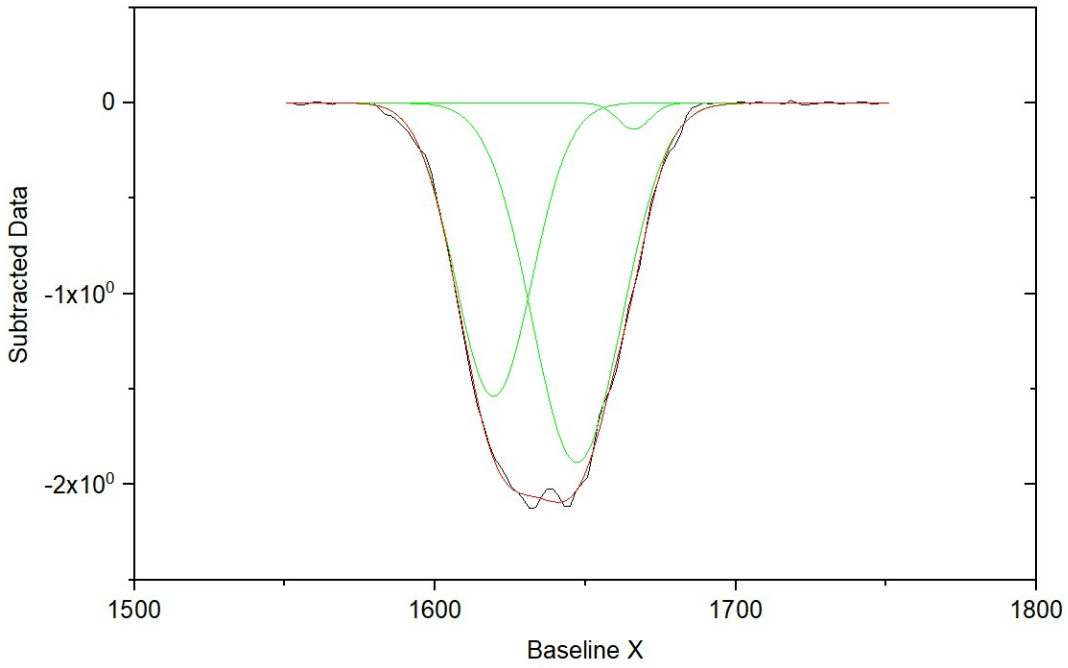
Peak Analysis

Data Set:[hexanol30carb]Sheet1!G"Nd" Date:10/4/2022

BaseLine:Line

Chi^2=6.51714E-04 Adj. R-Square=9.98988E-01 # of Data Points=105

SS=6.25646E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-48.89615	29.86437	-1.53812	1619.5	-40.46174
2	Gaussian	-70.08841	34.92746	-1.88515	1647.19894	-57.99841
3	Gaussian	-1.86085	12.71921	-0.13744	1666.06193	-1.53986

Figure S57. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.

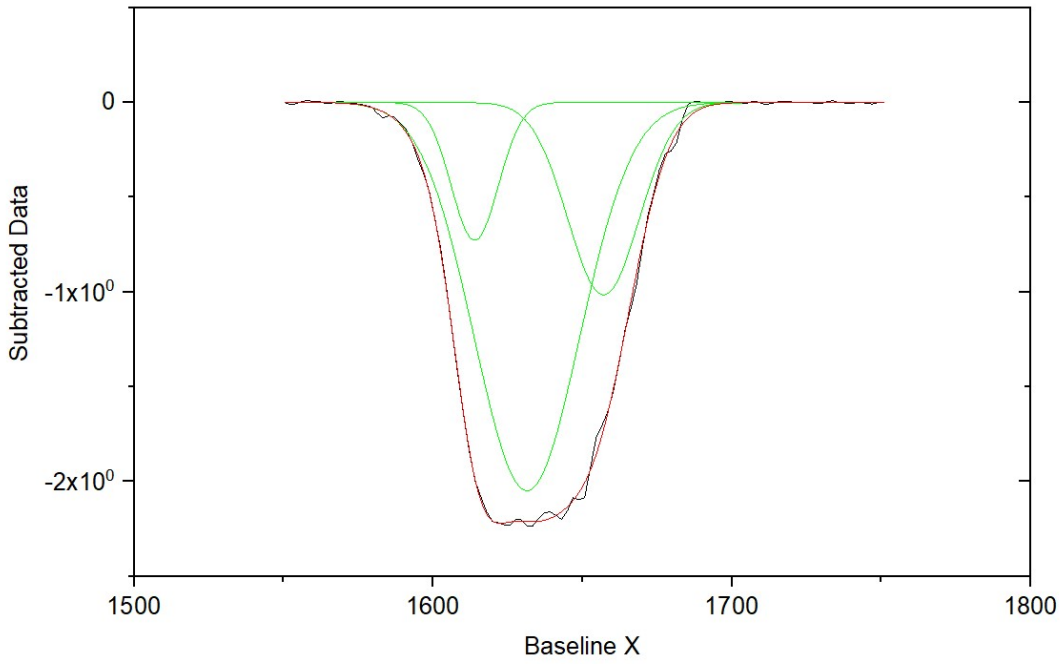
Peak Analysis

Data Set:[hexanol30carb]Sheet1!H"Sm" Date:10/4/2022

BaseLine:Line

Chi^2=5.66943E-04 Adj. R-Square=9.99272E-01 # of Data Points=105

SS=5.44266E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-14.34229	18.52175	-0.72745	1614.00697	-10.60846
2	Gaussian	-90.45134	41.48739	-2.04818	1631.47595	-66.90346
3	Gaussian	-30.40317	28.13601	-1.01514	1657.10973	-22.48808

Figure S58. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

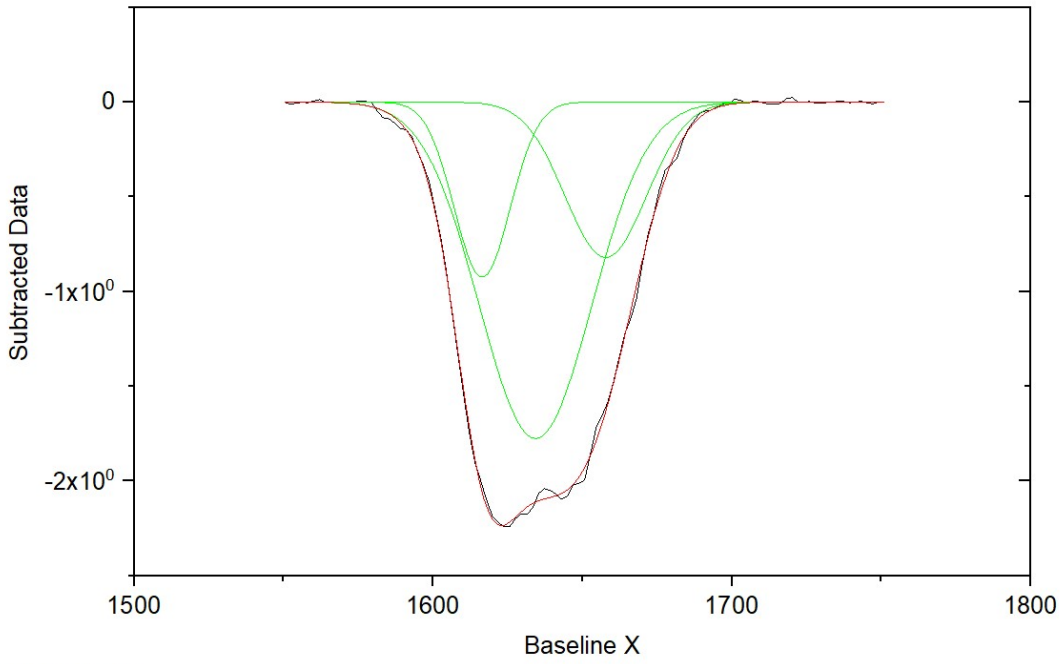
Peak Analysis

Data Set:[hexanol30carb]Sheet1!I"Eu" Date:10/4/2022

BaseLine:Line

Chi^2=5.53525E-04 Adj. R-Square=9.99236E-01 # of Data Points=105

SS=5.31384E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-21.67903	22.0591	-0.92325	1616.50252	-16.28151
2	Gaussian	-83.51406	44.17741	-1.77594	1634.353	-62.72124
3	Gaussian	-27.95808	32.02609	-0.82011	1657.83837	-20.99725

Figure S59. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

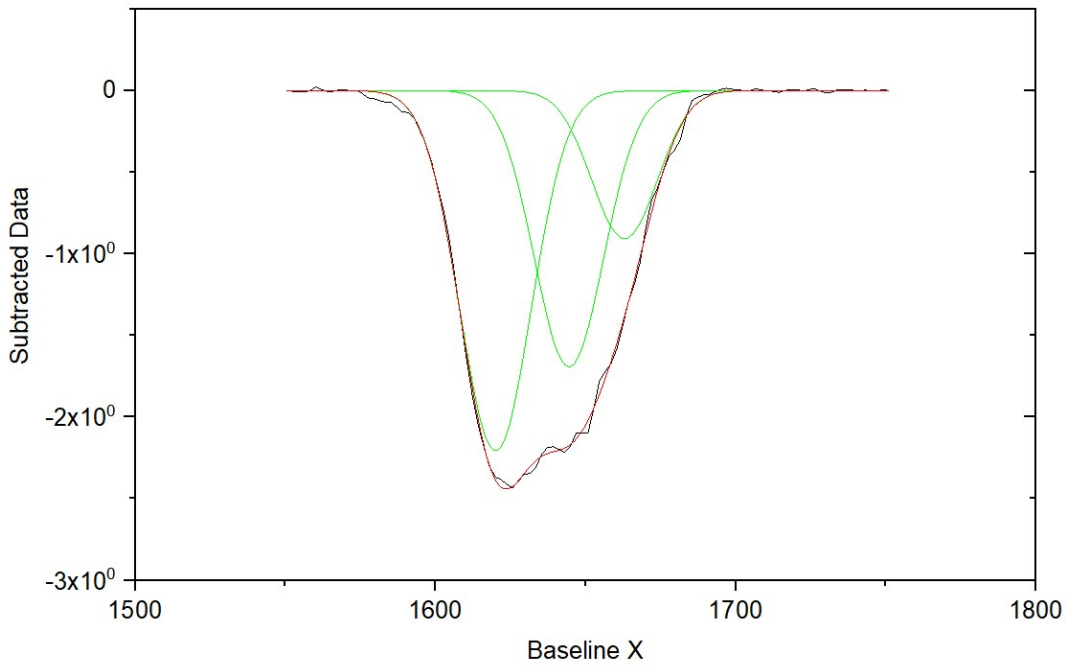
Peak Analysis

Data Set:[hexanol30carb]Sheet1!J"Gd" Date:10/4/2022

BaseLine:Line

Chi^2=8.64688E-04 Adj. R-Square=9.98959E-01 # of Data Points=105

SS=8.30101E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-65.97287	28.10111	-2.20551	1620.05198	-47.19695
2	Gaussian	-49.05974	27.25369	-1.69109	1644.51959	-35.09731
3	Gaussian	-24.74945	25.64147	-0.90676	1663.02195	-17.70574

Figure S60. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.

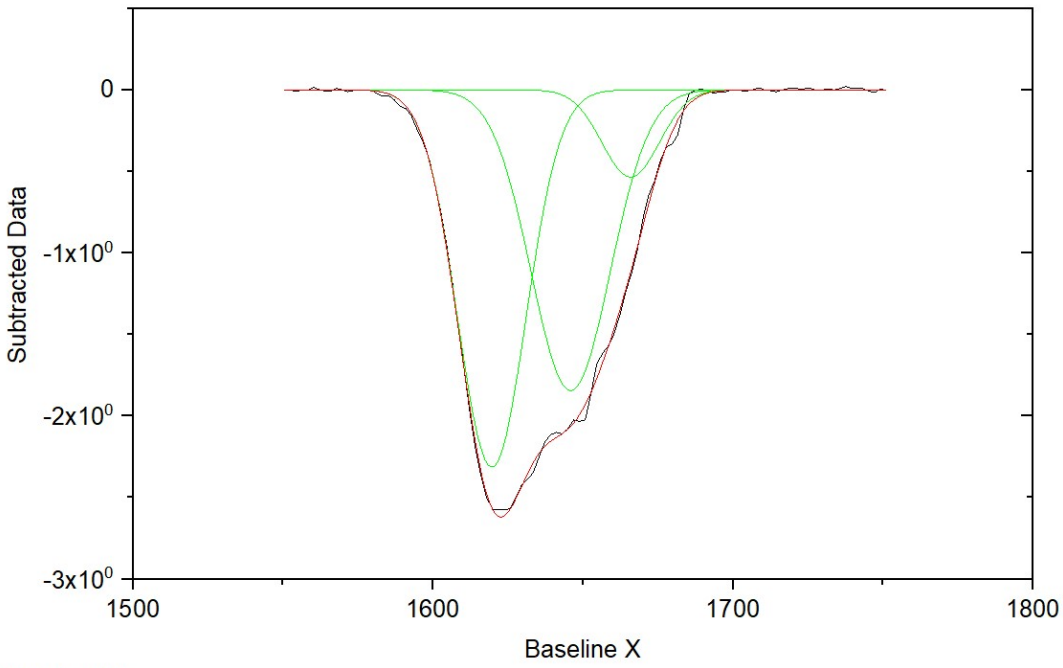
Peak Analysis

Data Set:[hexanol30carb]Sheet1!K"Tb" Date:10/4/2022

BaseLine:Line

Chi^2=8.36821E-04 Adj. R-Square=9.99030E-01 # of Data Points=105

SS=8.03348E-02 Degrees of Freedom=96



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-65.96519	26.79722	-2.31256	1619.62706	-47.25882
2	Gaussian	-60.8505	31.01276	-1.84328	1645.9229	-43.59456
3	Gaussian	-12.7671	22.4831	-0.53346	1665.90355	-9.14662

Figure S61. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

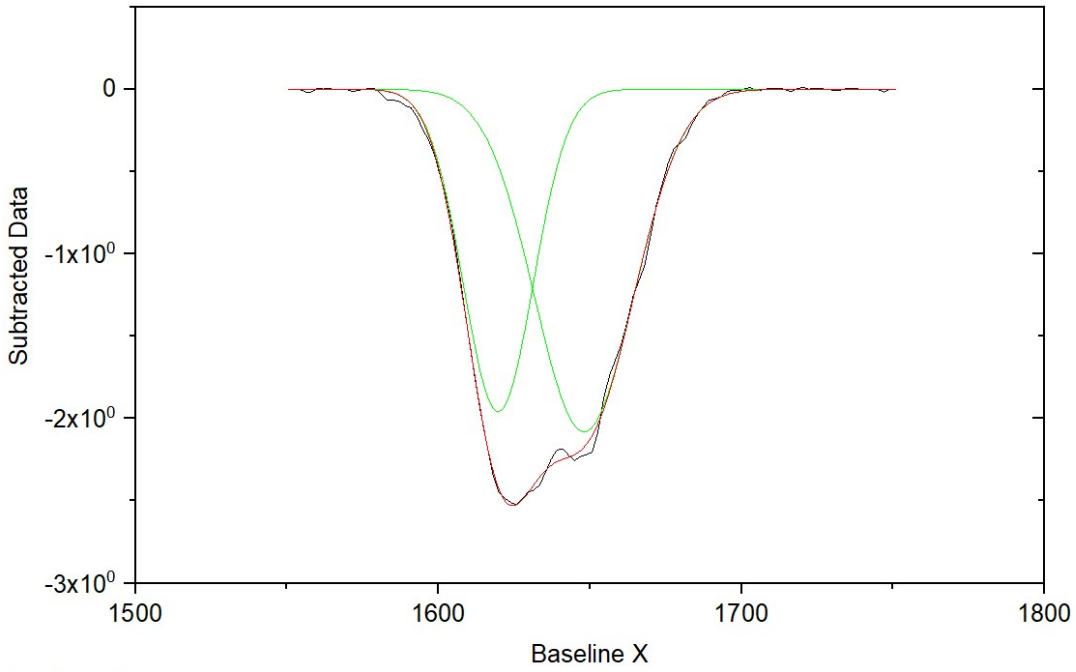
Peak Analysis

Data Set:[hexanol30carb]Sheet1!L"Dy" Date:10/4/2022

BaseLine:Line

Chi^2=9.32042E-04 Adj. R-Square=9.98925E-01 # of Data Points=105

SS=9.22722E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-56.36908	27.06144	-1.95685	1619.75749	-39.84396
2	Gaussian	-85.10551	38.43698	-2.08006	1648.07982	-60.15604

Figure S62. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.

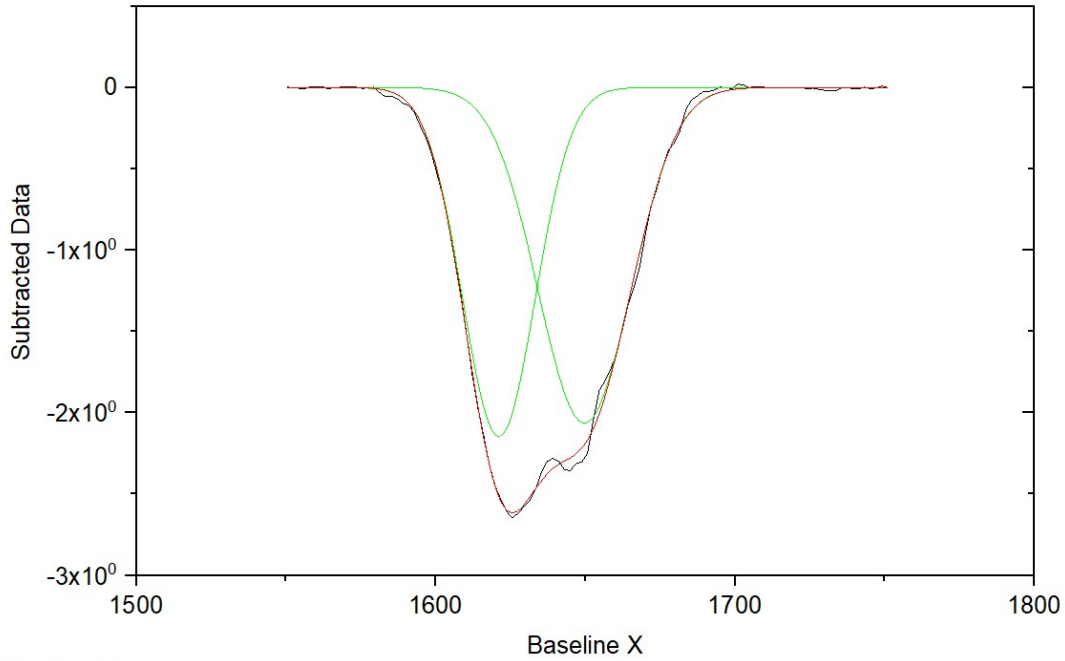
Peak Analysis

Data Set:[hexanol30carb]Sheet1!M"Ho" Date:10/4/2022

BaseLine:Line

Chi^2=1.22307E-03 Adj. R-Square=9.98675E-01 # of Data Points=105

SS=1.21084E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-65.14495	28.54157	-2.14423	1621.15225	-44.9079
2	Gaussian	-79.91851	36.3979	-2.06271	1649.73885	-55.0921

Figure S63. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.

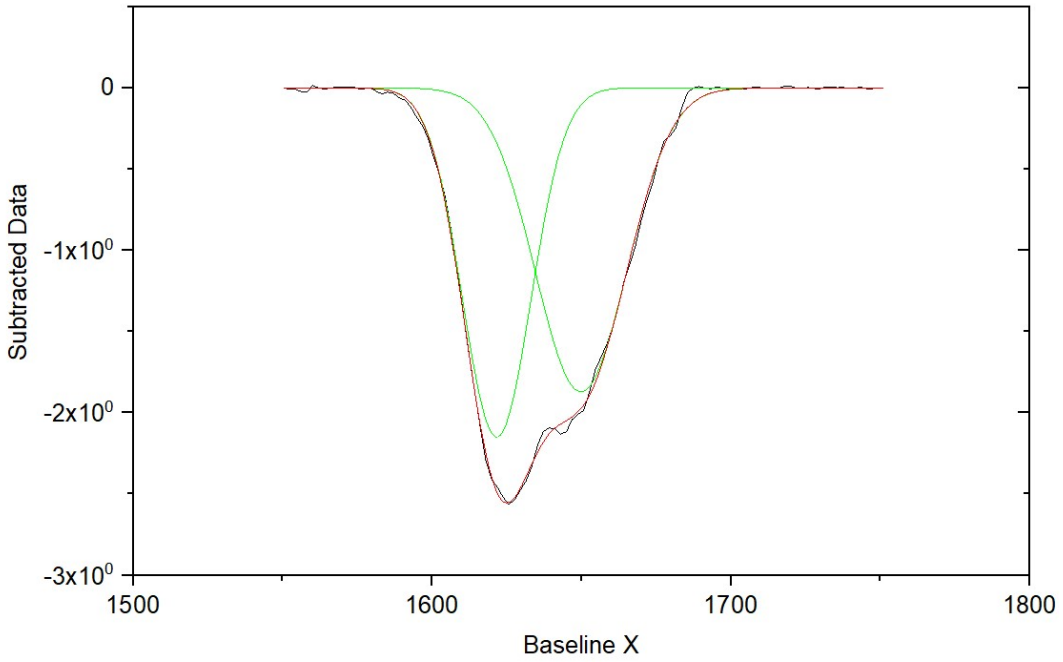
Peak Analysis

Data Set:[hexanol30carb]Sheet1!N"Er" Date:10/4/2022

BaseLine:Line

Chi^2=8.69203E-04 Adj. R-Square=9.98929E-01 # of Data Points=105

SS=8.60511E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-61.61407	26.94036	-2.14854	1621.68929	-46.31311
2	Gaussian	-71.42401	35.87526	-1.87032	1649.85982	-53.68689

Figure S64. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.

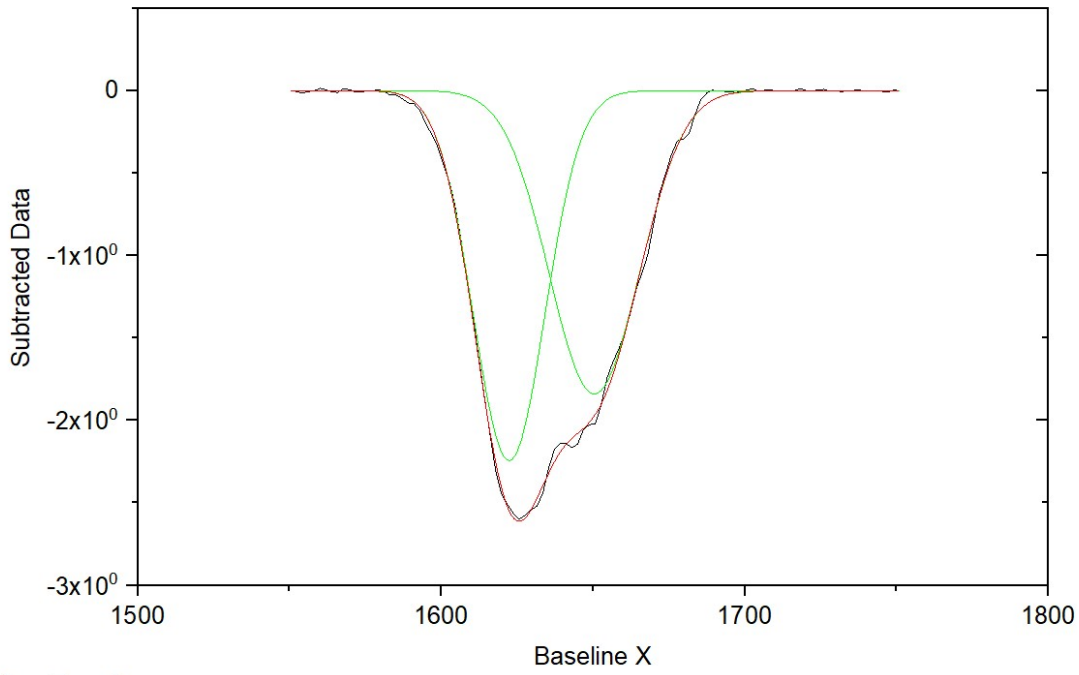
Peak Analysis

Data Set:[hexanol30carb]Sheet1!O"Tm" Date:11/2/2022

BaseLine:Line

Chi^2=9.24131E-04 Adj. R-Square=9.98899E-01 # of Data Points=105

SS=9.14890E-02 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-66.40863	27.8193	-2.24257	1622.37499	-49.31736
2	Gaussian	-68.24706	34.85965	-1.8392	1650.44443	-50.68264

Figure S65. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.

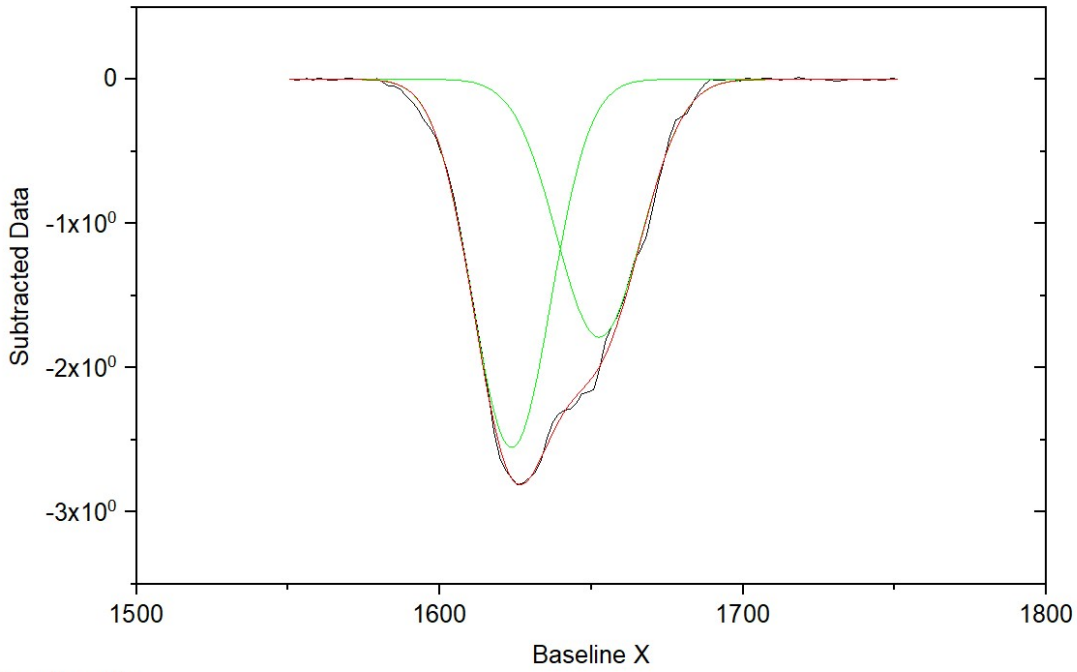
Peak Analysis

Data Set:[hexanol30carb]Sheet1!P"Yb" Date:10/4/2022

BaseLine:Line

Chi^2=1.41915E-03 Adj. R-Square=9.98524E-01 # of Data Points=105

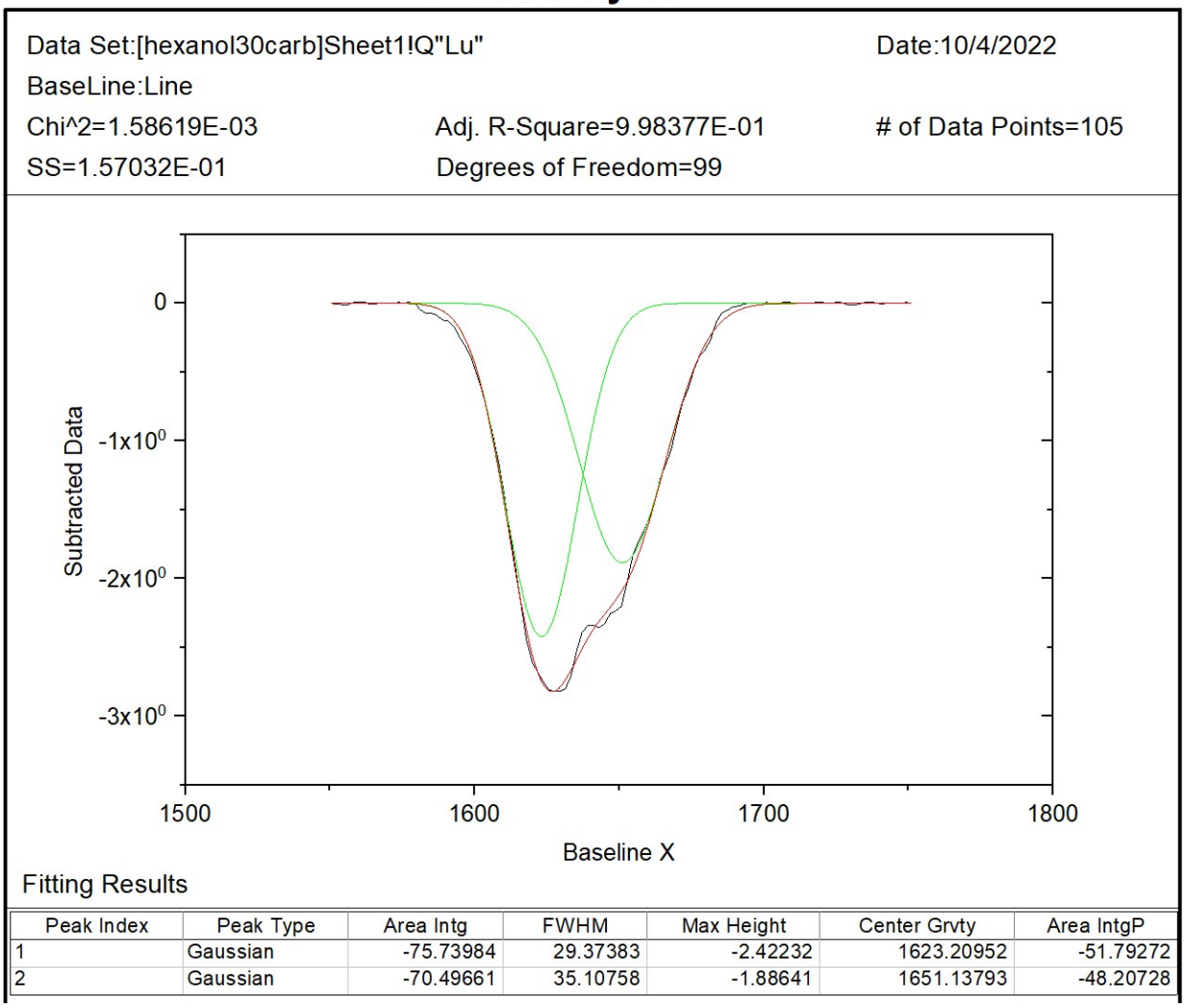
SS=1.40496E-01 Degrees of Freedom=99



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-82.28609	30.27876	-2.55303	1623.75448	-56.71404
2	Gaussian	-62.80336	32.98865	-1.78849	1652.58194	-43.28596

Figure S66. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-75.73984	29.37383	-2.42232	1623.20952	-51.79272
2	Gaussian	-70.49661	35.10758	-1.88641	1651.13793	-48.20728

Figure S67. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-hexanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

5 vol% 1-octanol

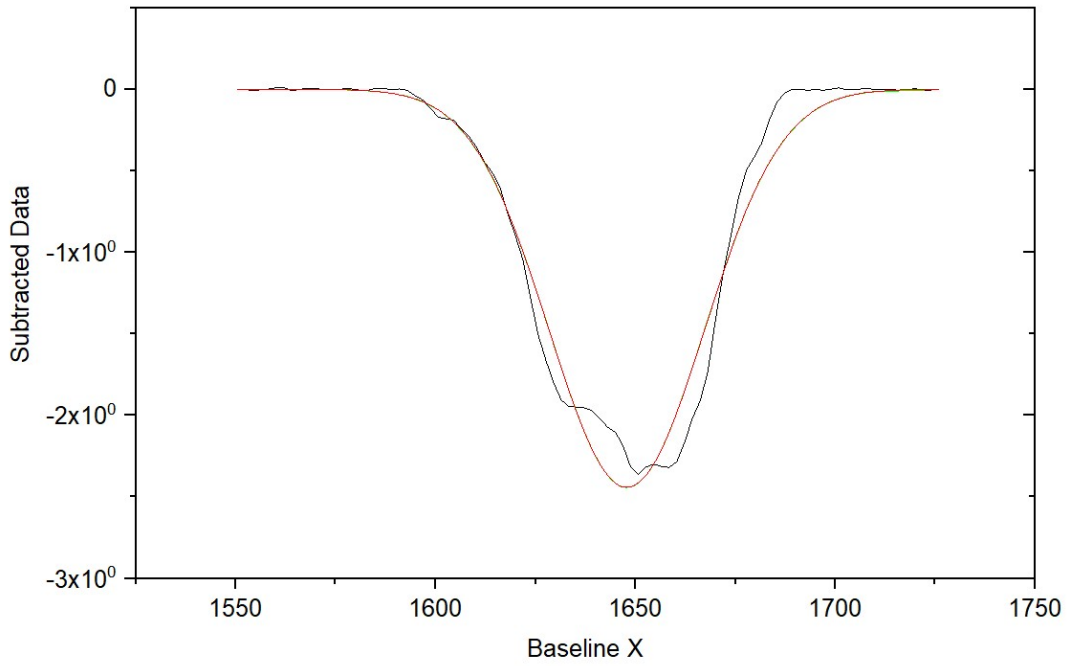
Peak Analysis

Data Set:[Book1]Sheet1!B"fresh_TODGA" Date:10/5/2022

BaseLine:Line

Chi^2=2.10916E-02 Adj. R-Square=9.72210E-01 # of Data Points=92

SS=1.87715E+00 Degrees of Freedom=89



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-118.61489	45.63494	-2.44187	1647.85291	-100

Figure S68. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 5 vol% 1-octanol in n-dodecane.

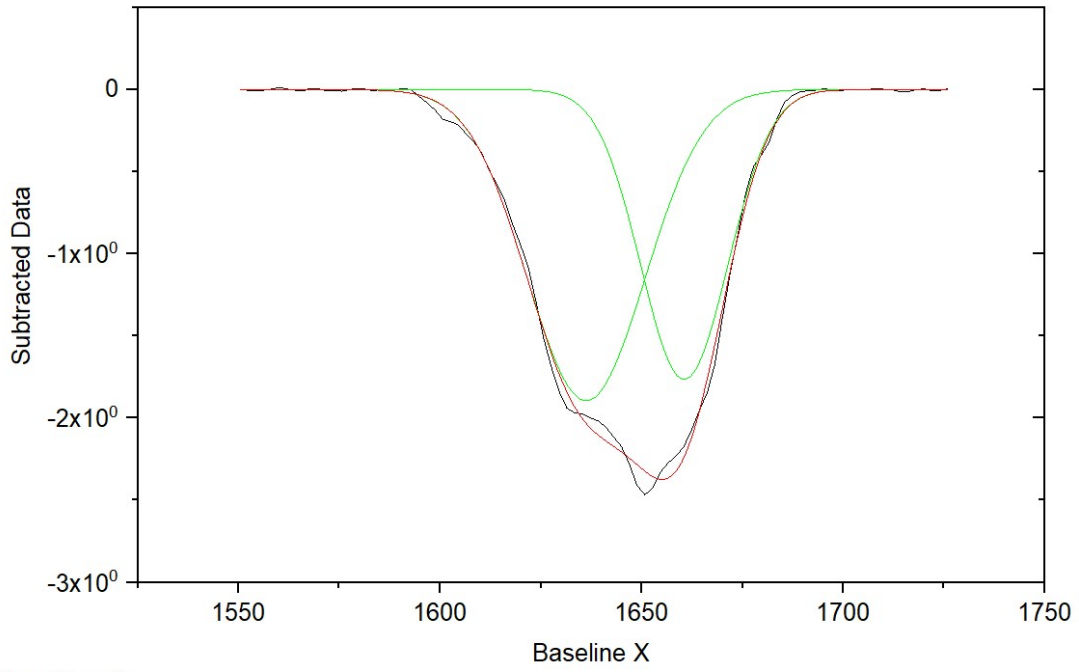
Peak Analysis

Data Set:[Book1]Sheet1!C"preeqm_TODGA" Date:10/5/2022

BaseLine:Line

Chi^2=2.40035E-03 Adj. R-Square=9.96875E-01 # of Data Points=92

SS=2.06430E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-47.74273	25.43437	-1.76341	1660.57506	-40.78421
2	Gaussian	-69.31906	34.38393	-1.89393	1636.24621	-59.21579

Figure S69. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 1 M HNO_3.

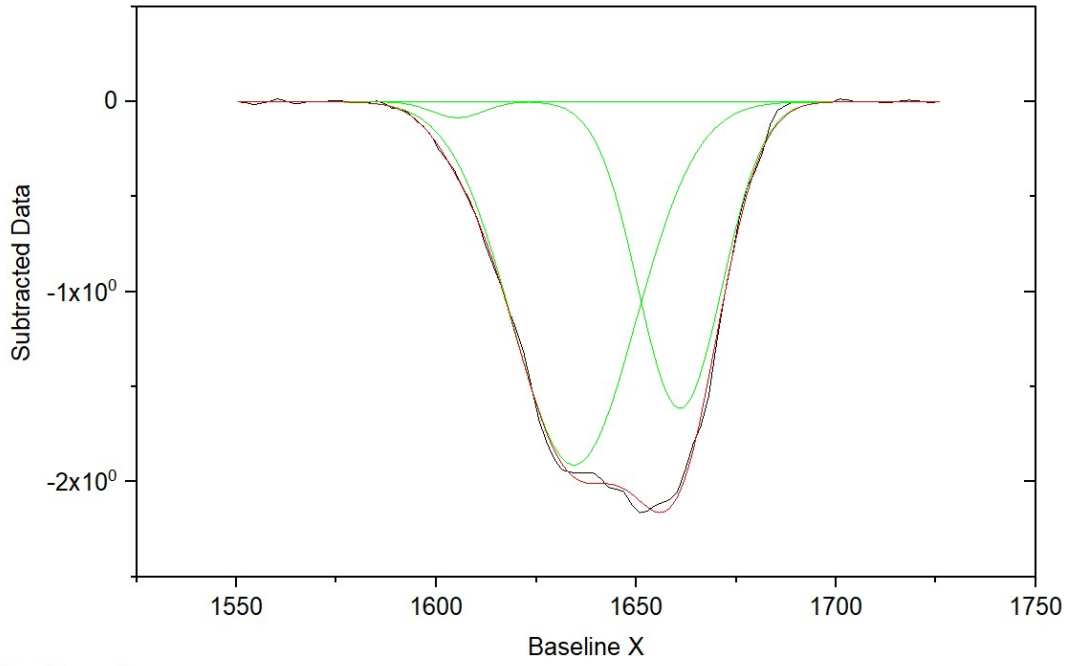
Peak Analysis

Data Set:[Book1]Sheet1!D"La" Date:10/5/2022

BaseLine:Line

Chi^2=8.53484E-04 Adj. R-Square=9.98762E-01 # of Data Points=92

SS=7.08392E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-42.3835	24.69157	-1.61256	1660.96603	-36.01738
2	Gaussian	-73.9327	36.33649	-1.91144	1634.45388	-62.82781
3	Gaussian	-1.35892	15.20015	-0.08399	1605.34354	-1.15481

Figure S70. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

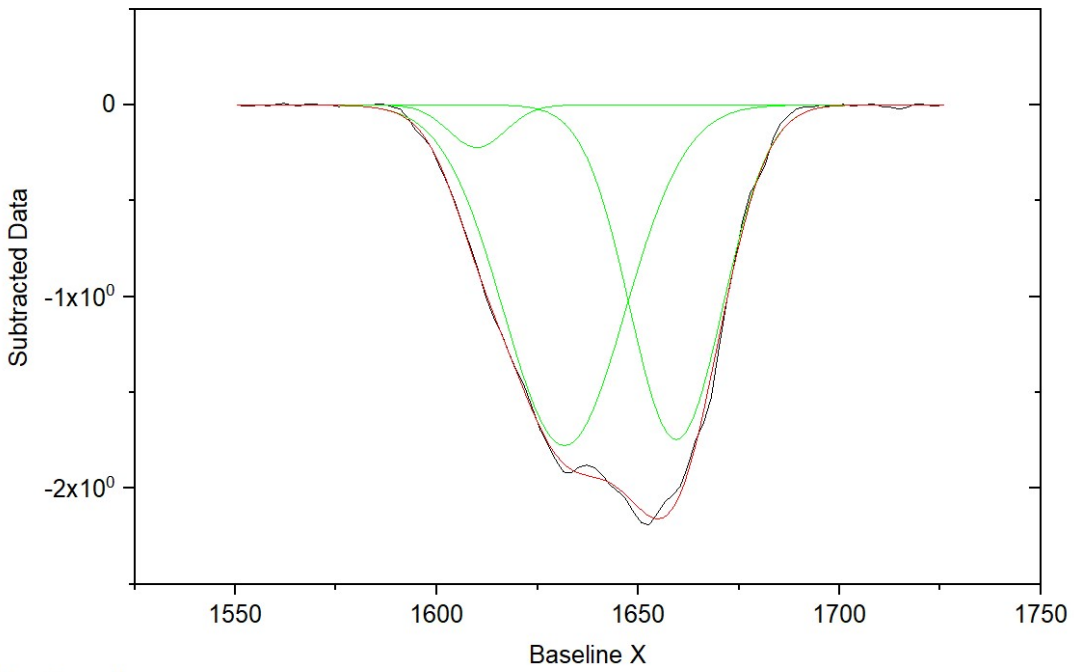
Peak Analysis

Data Set:[Book1]Sheet1!E"Ce" Date:10/5/2022

BaseLine:Line

Chi^2=8.99563E-04 Adj. R-Square=9.98674E-01 # of Data Points=92

SS=7.46637E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-67.2453	35.56285	-1.77637	1631.68963	-55.3187
2	Gaussian	-50.39115	27.14002	-1.74426	1659.45002	-41.45379
3	Gaussian	-3.92335	16.68236	-0.22094	1609.99412	-3.2275

Figure S71. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

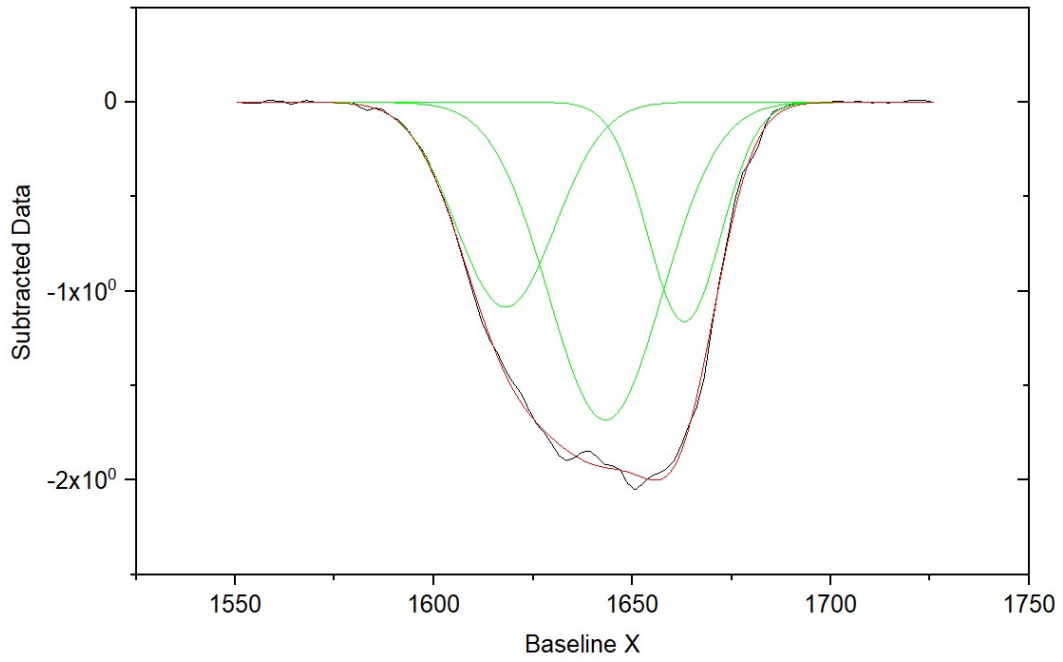
Peak Analysis

Data Set:[Book1]Sheet1!F"Pr" Date:10/5/2022

BaseLine:Line

Chi^2=7.72487E-04 Adj. R-Square=9.98792E-01 # of Data Points=92

SS=6.41165E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-60.28303	33.68001	-1.68148	1643.24001	-49.89666
2	Gaussian	-26.80068	21.68833	-1.16088	1663.11418	-22.1831
3	Gaussian	-33.73204	29.22645	-1.08426	1618.09571	-27.92024

Figure S72. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

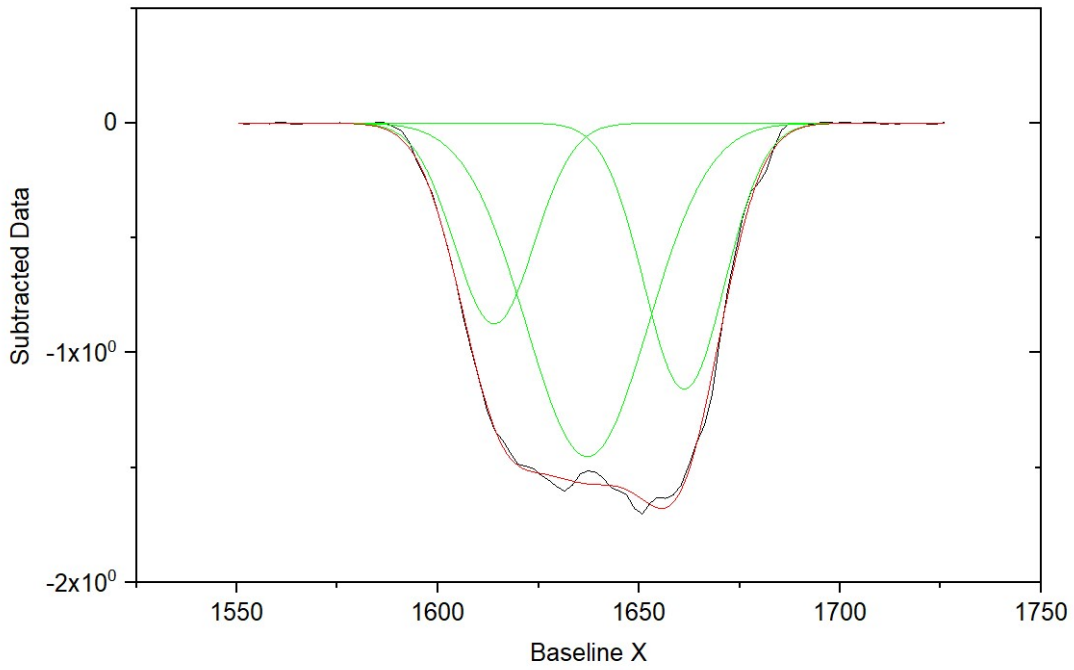
Peak Analysis

Data Set:[Book1]Sheet1!G"Nd" Date:10/5/2022

BaseLine:Line

Chi^2=7.35106E-04 Adj. R-Square=9.98462E-01 # of Data Points=92

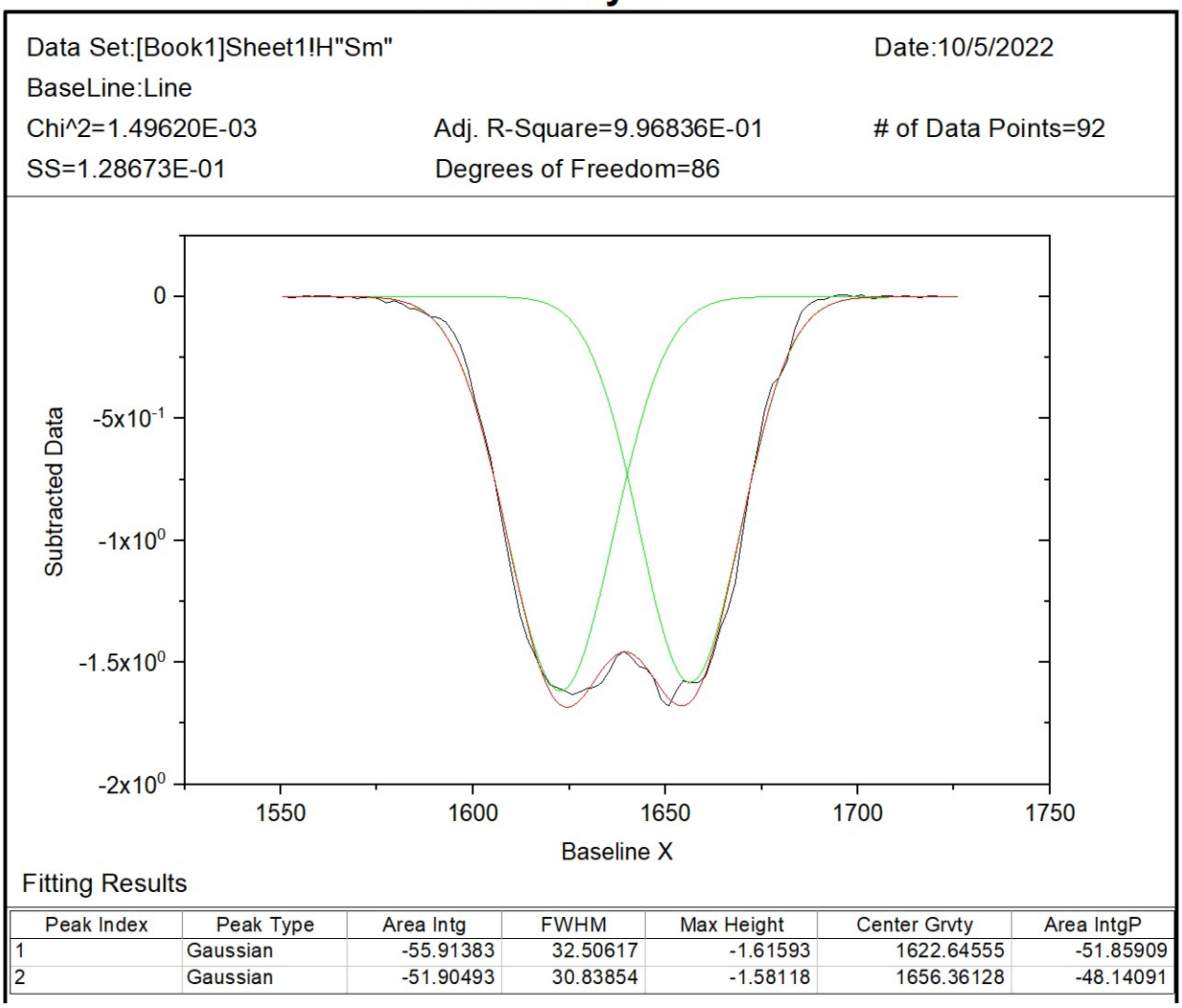
SS=6.10138E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-55.20371	35.68429	-1.45331	1637.14009	-52.14071
2	Gaussian	-29.06261	23.56414	-1.15865	1661.27655	-27.45006
3	Gaussian	-21.60817	23.2096	-0.87462	1613.99471	-20.40923

Figure S73. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-55.91383	32.50617	-1.61593	1622.64555	-51.85909
2	Gaussian	-51.90493	30.83854	-1.58118	1656.36128	-48.14091

Figure S74. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

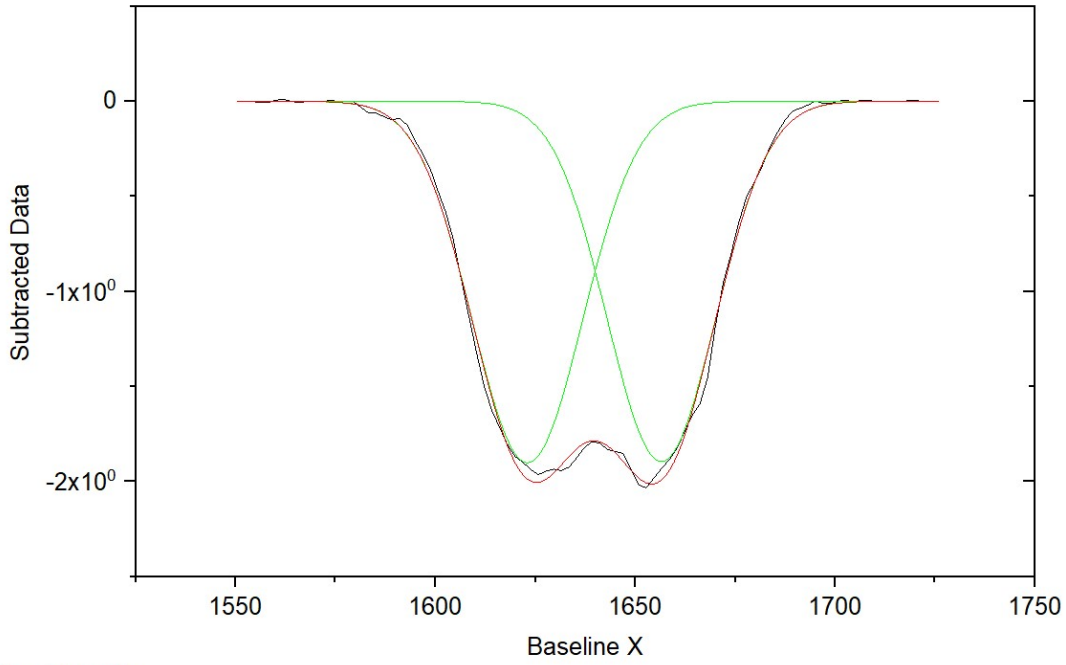
Peak Analysis

Data Set:[Book1]Sheet1!I"Eu" Date:10/5/2022

BaseLine:Line

Chi^2=1.35461E-03 Adj. R-Square=9.98003E-01 # of Data Points=92

SS=1.16496E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-65.72177	32.47758	-1.90105	1623.02999	-50.62245
2	Gaussian	-64.10555	31.79452	-1.89414	1656.54802	-49.37755

Figure S75. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

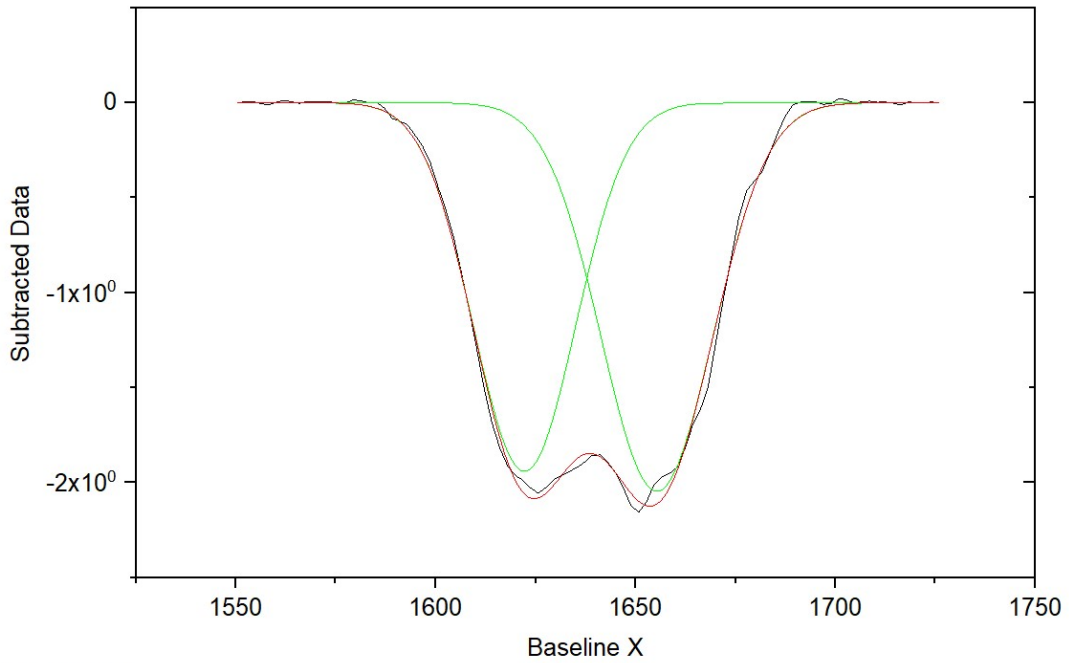
Peak Analysis

Data Set:[Book1]Sheet1!J"Gd" Date:10/5/2022

BaseLine:Line

Chi^2=1.98636E-03 Adj. R-Square=9.97331E-01 # of Data Points=92

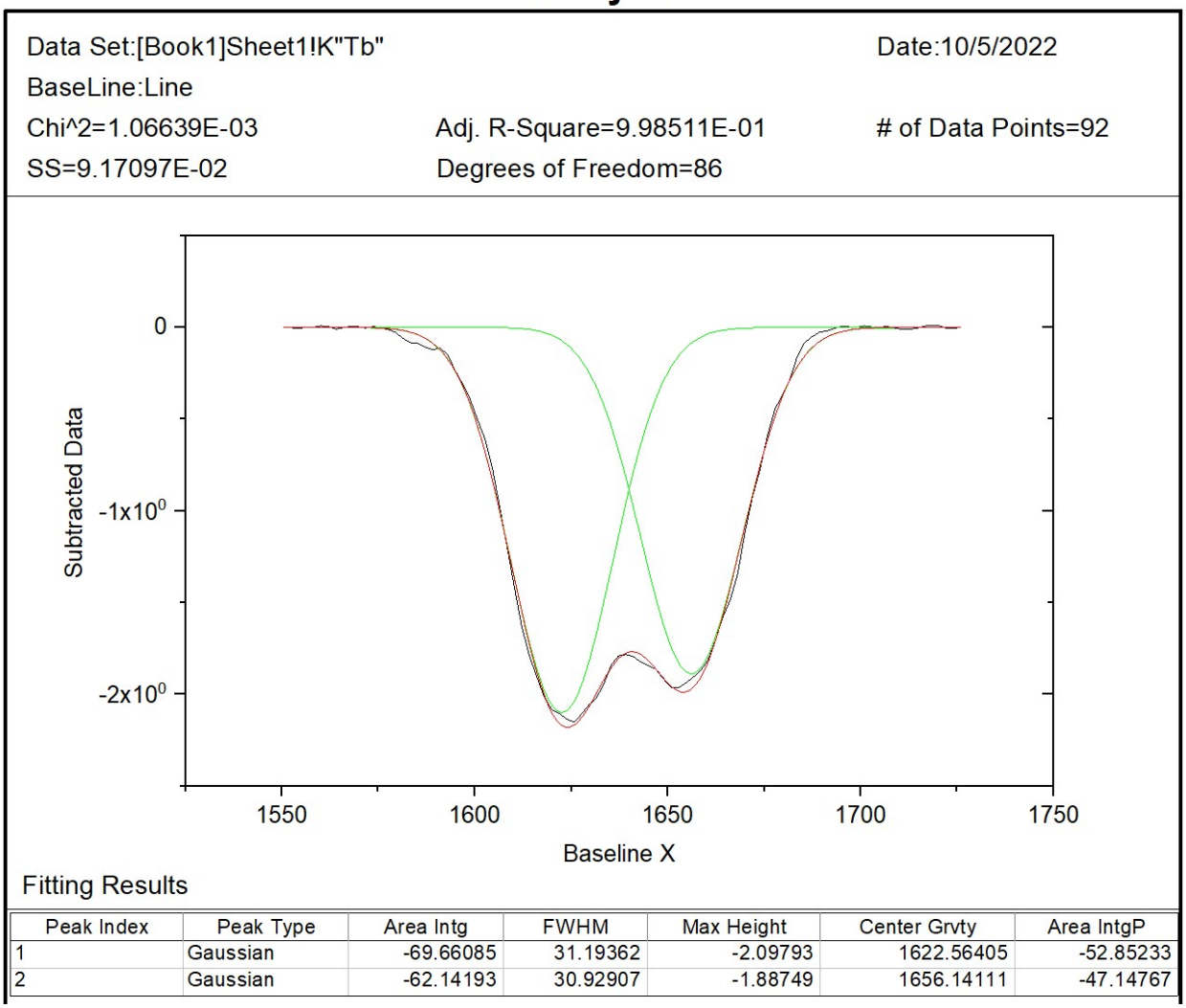
SS=1.70827E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-62.21422	30.11714	-1.94063	1622.23655	-46.59122
2	Gaussian	-71.31785	32.75475	-2.04546	1655.35687	-53.40878

Figure S76. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-69.66085	31.19362	-2.09793	1622.56405	-52.85233
2	Gaussian	-62.14193	30.92907	-1.88749	1656.14111	-47.14767

Figure S77. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

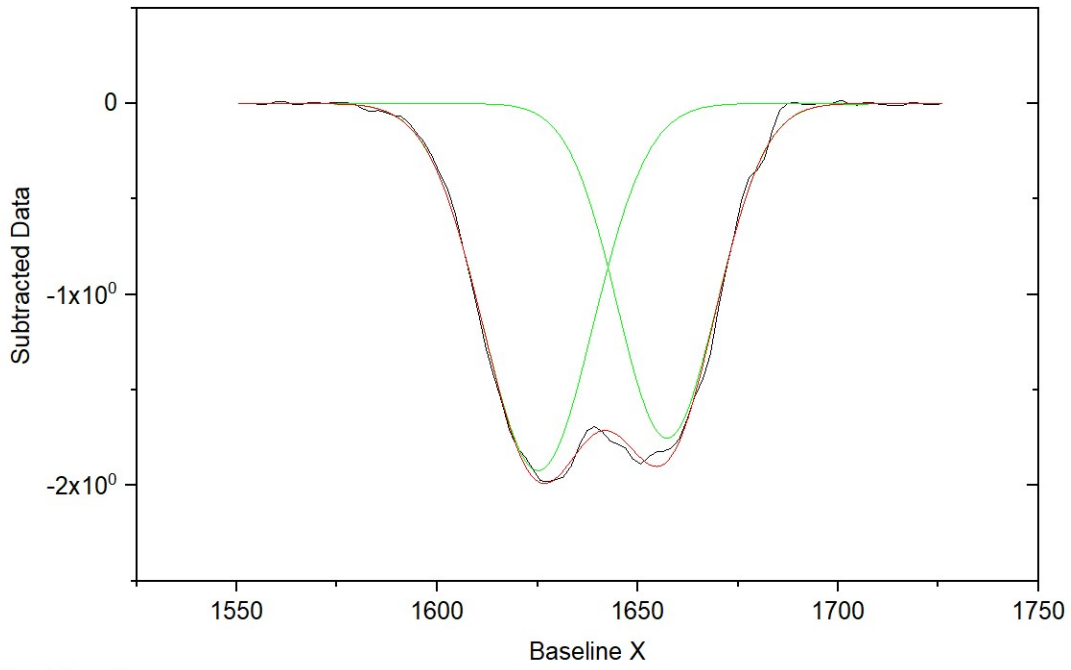
Peak Analysis

Data Set:[Book1]Sheet1!L"Dy" Date:10/5/2022

BaseLine:Line

Chi^2=1.15266E-03 Adj. R-Square=9.98166E-01 # of Data Points=92

SS=9.91284E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-65.99567	32.2502	-1.92243	1625.14878	-54.9501
2	Gaussian	-54.10541	29.00207	-1.75259	1657.30665	-45.0499

Figure S78. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.

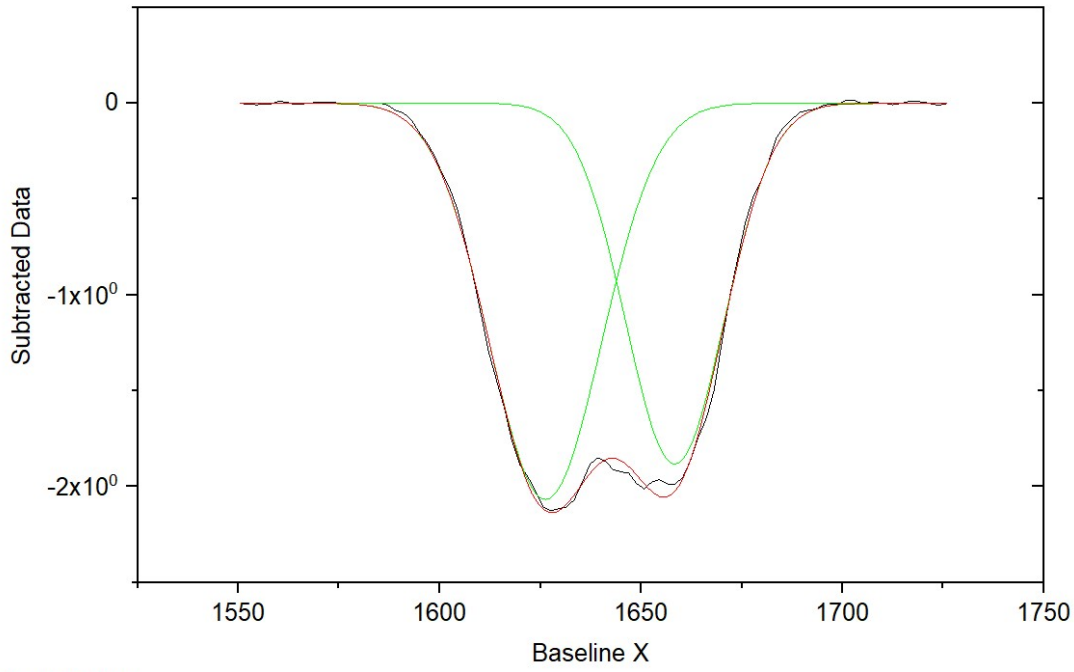
Peak Analysis

Data Set:[Book1]Sheet1!M"Ho" Date:10/5/2022

BaseLine:Line

Chi^2=9.63036E-04 Adj. R-Square=9.98681E-01 # of Data Points=92

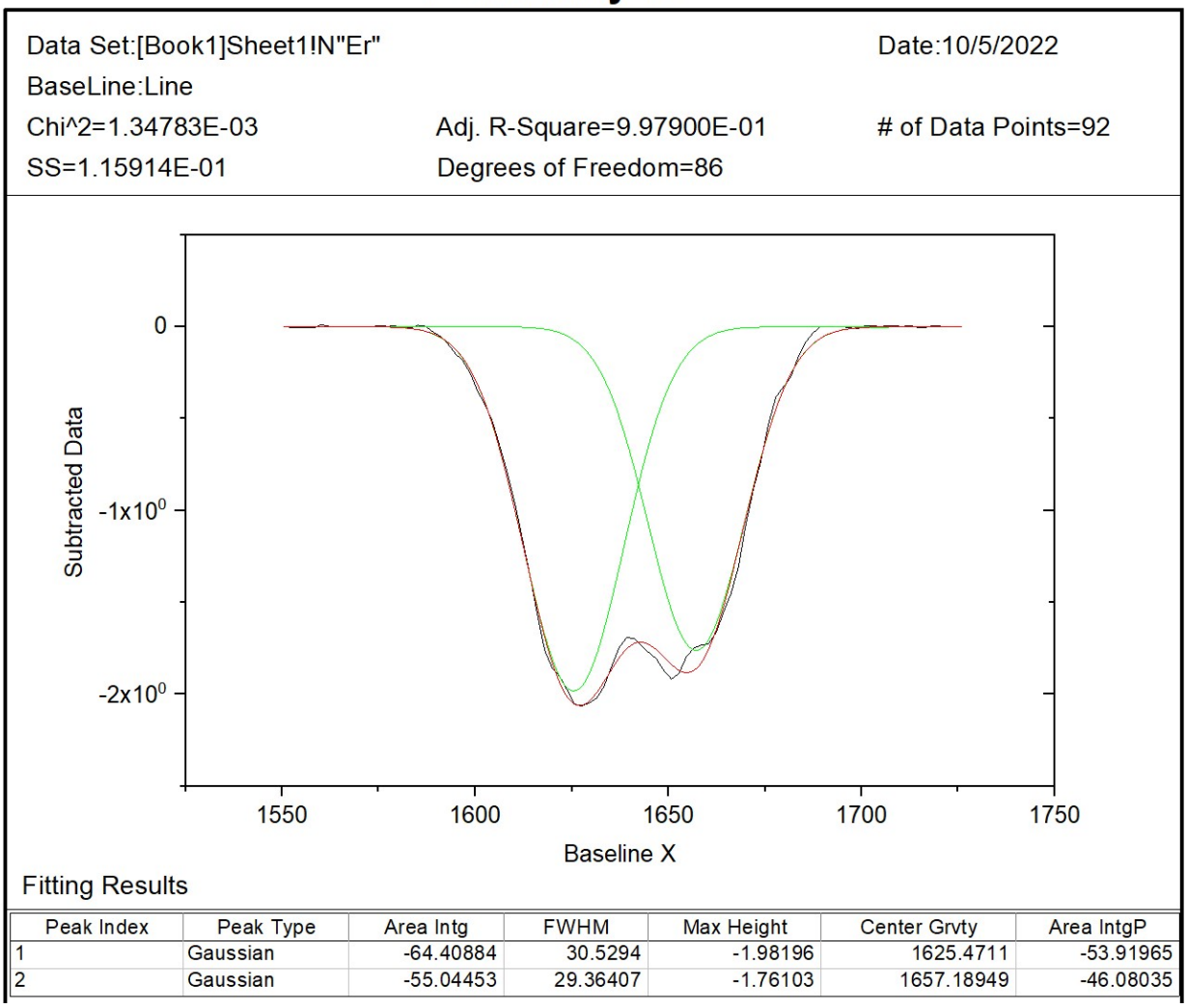
SS=8.28211E-02 Degrees of Freedom=86



Fitting Results

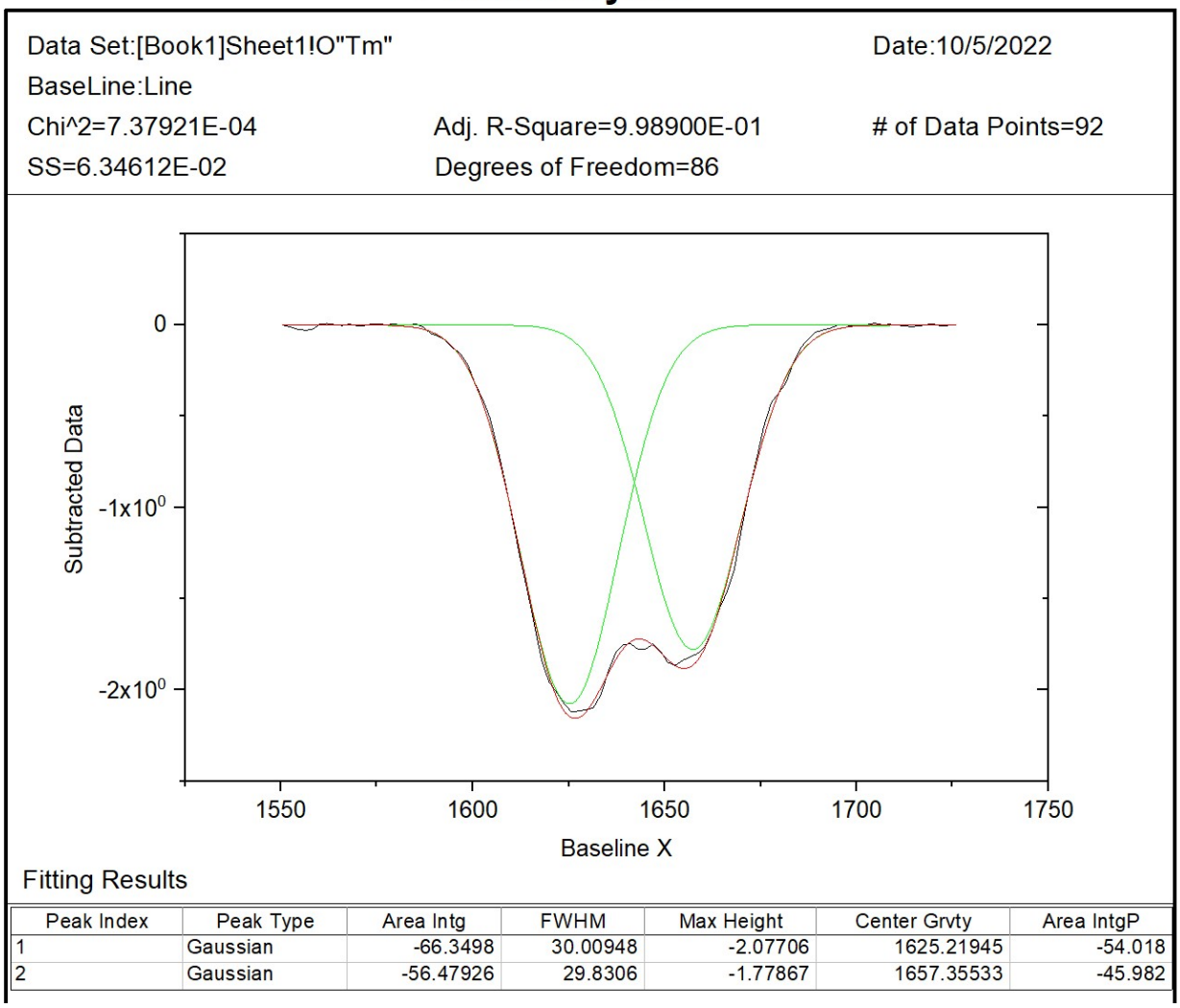
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-71.99766	32.7169	-2.06735	1626.2767	-55.56964
2	Gaussian	-57.56528	28.74337	-1.88144	1658.38637	-44.43036

Figure S79. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-64.40884	30.5294	-1.98196	1625.4711	-53.91965
2	Gaussian	-55.04453	29.36407	-1.76103	1657.18949	-46.08035

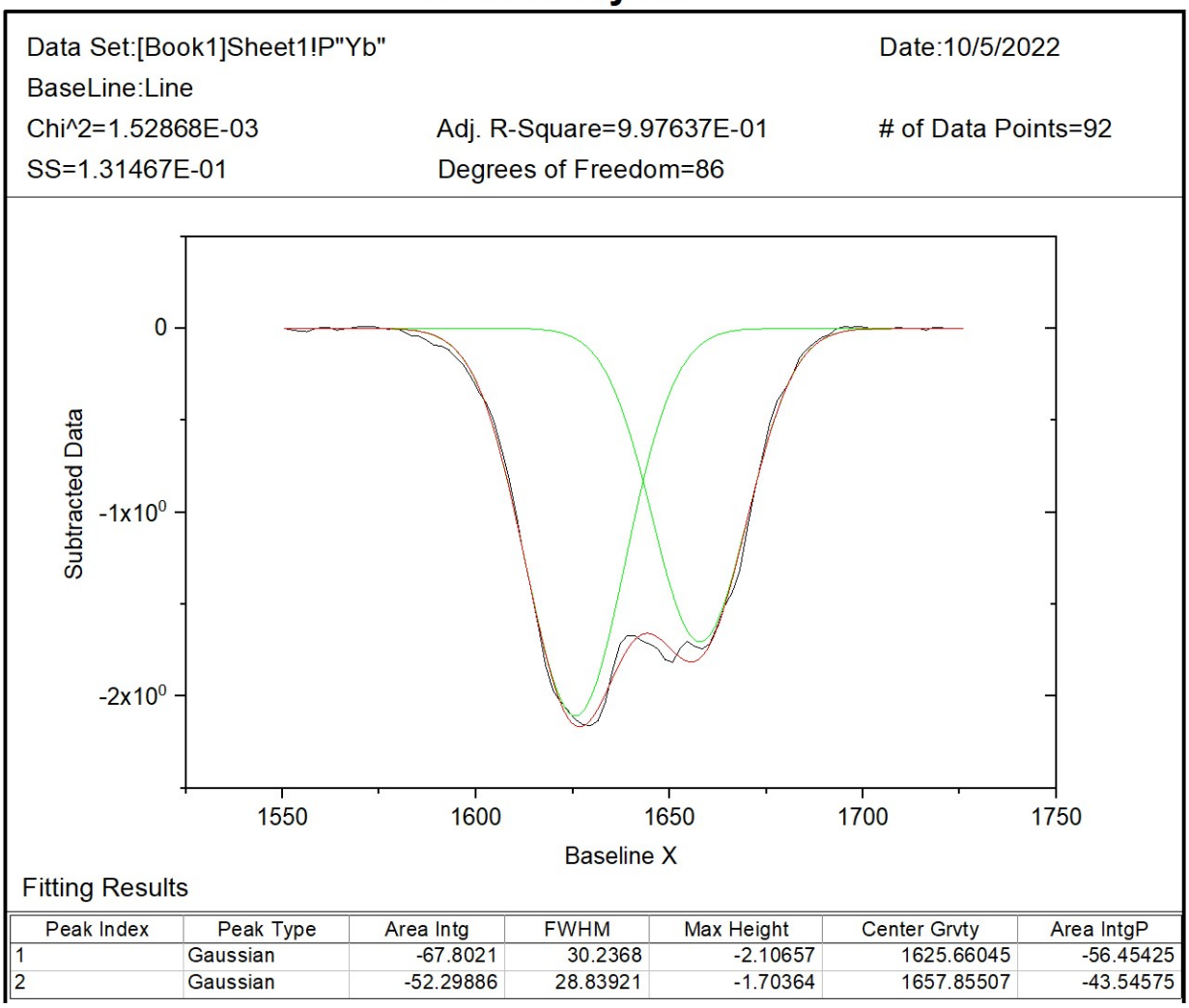
Figure S80. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $ER(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-66.3498	30.00948	-2.07706	1625.21945	-54.018
2	Gaussian	-56.47926	29.8306	-1.77867	1657.35533	-45.982

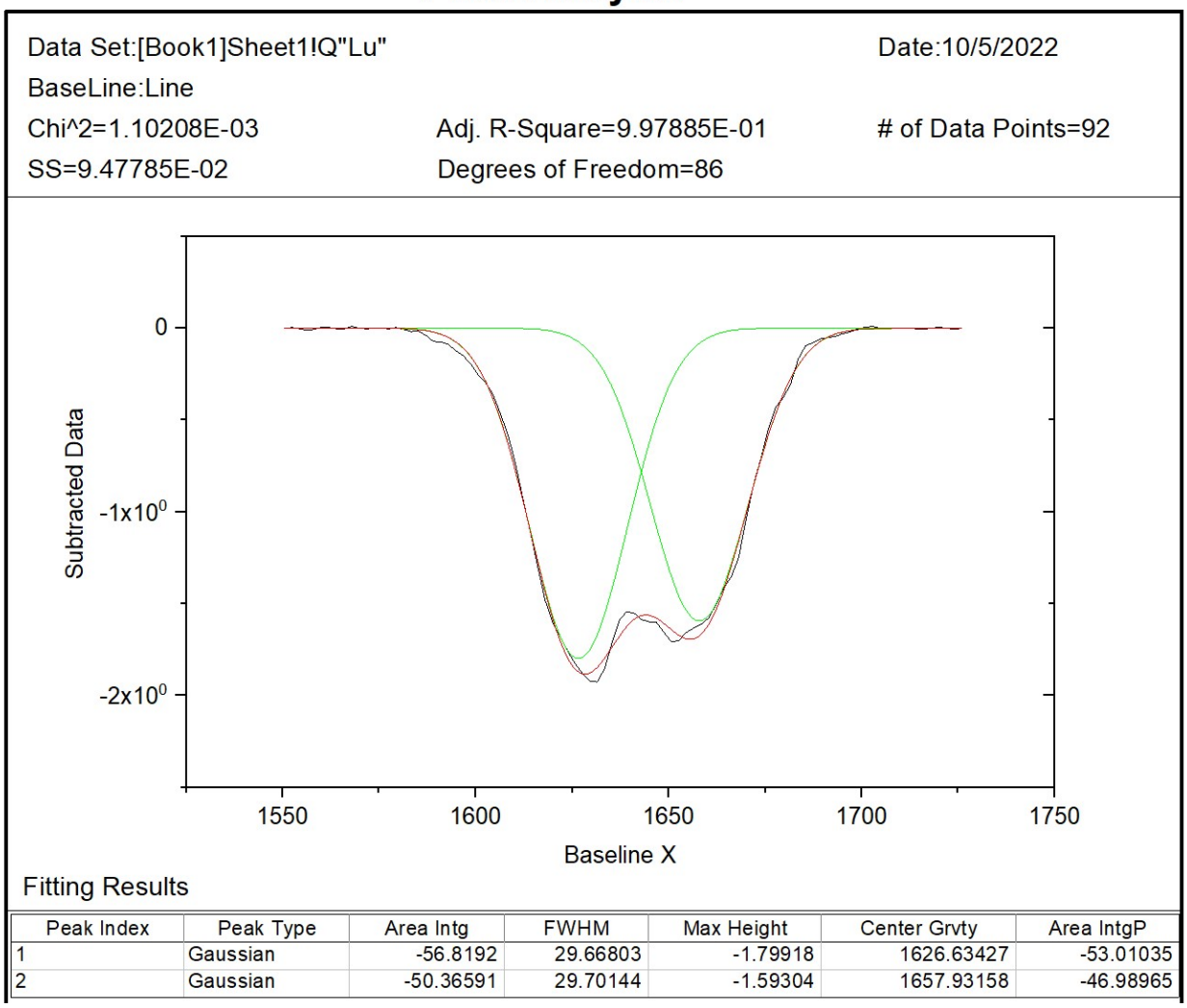
Figure S81. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-67.8021	30.2368	-2.10657	1625.66045	-56.45425
2	Gaussian	-52.29886	28.83921	-1.70364	1657.85507	-43.54575

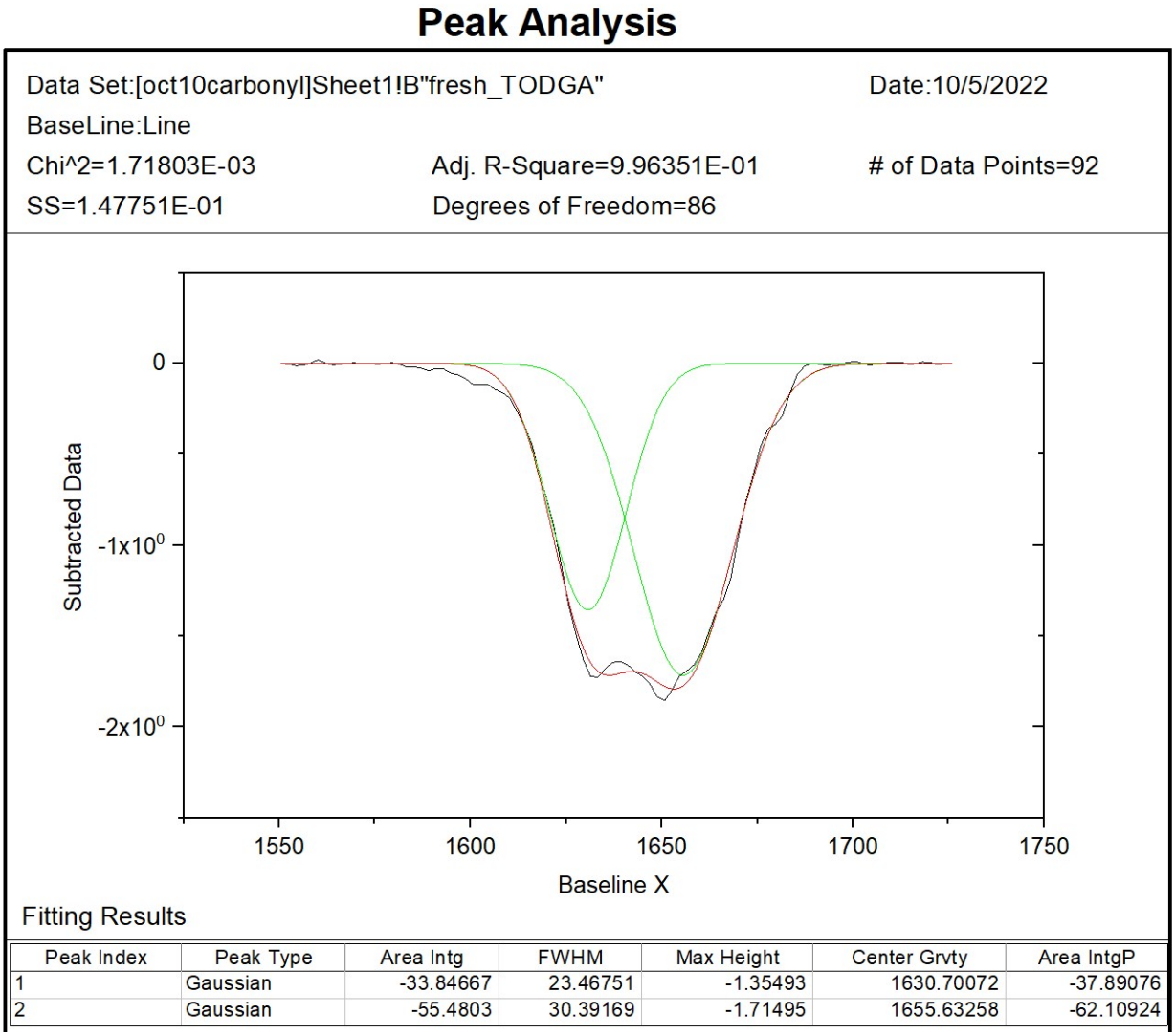
Figure S82. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-56.8192	29.66803	-1.79918	1626.63427	-53.01035
2	Gaussian	-50.36591	29.70144	-1.59304	1657.93158	-46.98965

Figure S83. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-octanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

10 vol% 1-octanol



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-33.84667	23.46751	-1.35493	1630.70072	-37.89076
2	Gaussian	-55.4803	30.39169	-1.71495	1655.63258	-62.10924

Figure S84. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 10 vol% 1-octanol in n-dodecane.

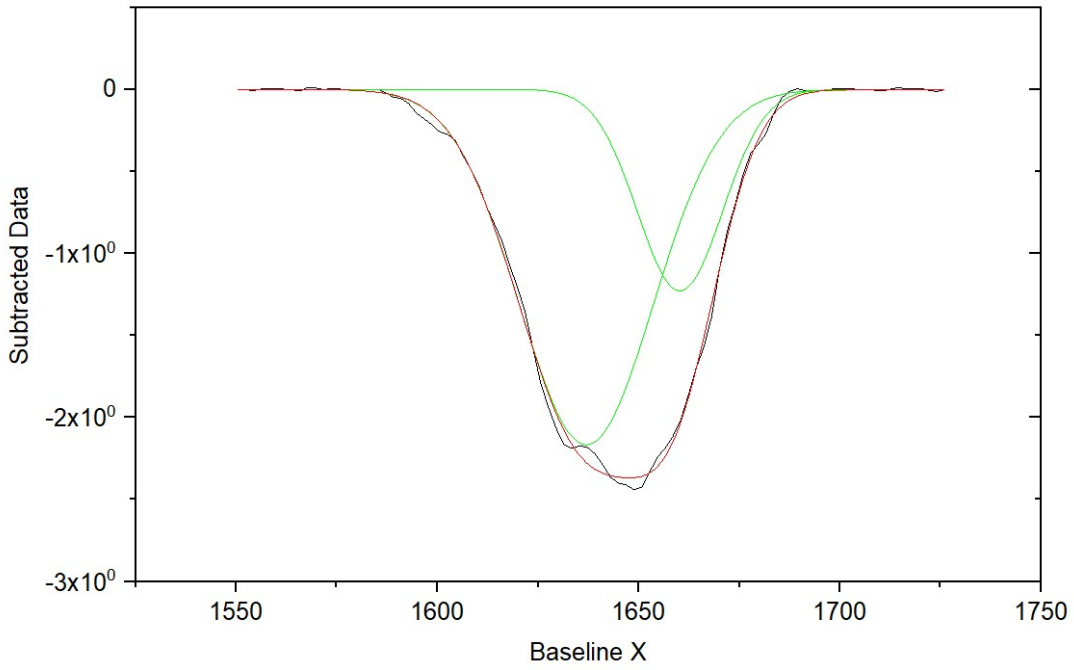
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!C"preeqm_TODGA" Date:10/5/2022

BaseLine:Line

Chi^2=1.54838E-03 Adj. R-Square=9.98074E-01 # of Data Points=92

SS=1.33161E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-90.23387	39.13737	-2.16594	1637.00448	-73.47699
2	Gaussian	-32.57175	24.91763	-1.22801	1660.25993	-26.52301

Figure S85. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 10 vol% 1-octanol in n-dodecane after contact with 1 M HNO_3.

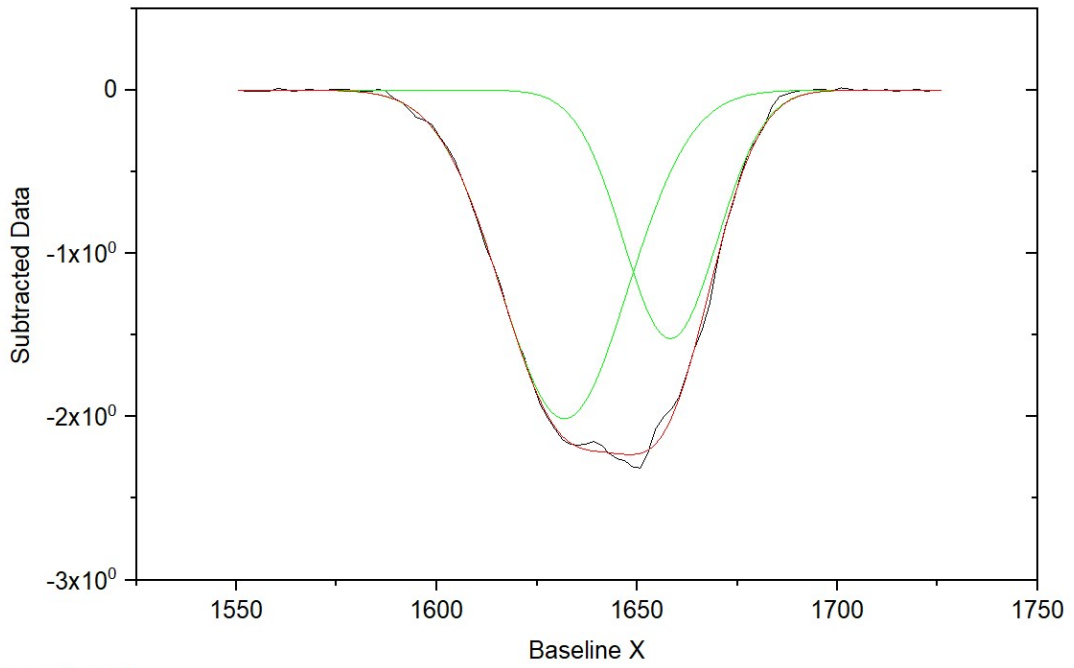
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!D"La" Date:10/5/2022

BaseLine:Line

Chi^2=9.37016E-04 Adj. R-Square=9.98774E-01 # of Data Points=92

SS=8.05833E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-79.90759	37.30396	-2.01234	1631.86939	-64.17725
2	Gaussian	-44.60318	27.55343	-1.52075	1658.28664	-35.82275

Figure S86. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

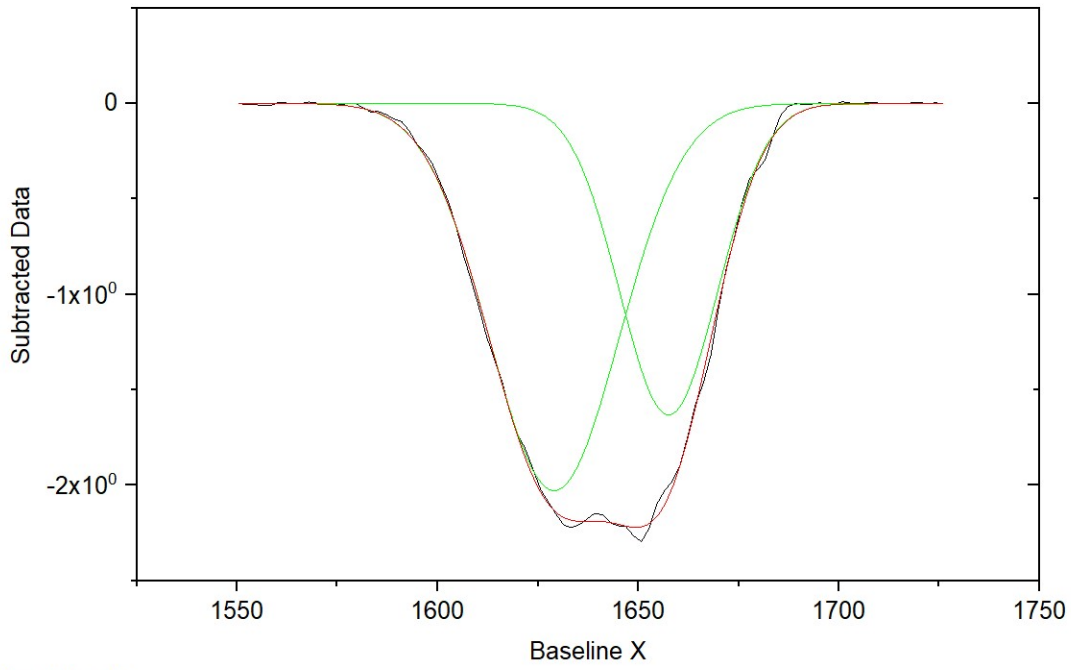
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!E"Ce" Date:10/5/2022

BaseLine:Line

Chi^2=8.38530E-04 Adj. R-Square=9.98934E-01 # of Data Points=92

SS=7.21136E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-82.14572	38.05901	-2.02766	1629.06988	-62.27076
2	Gaussian	-49.77128	28.67867	-1.63038	1657.56986	-37.72924

Figure S87. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

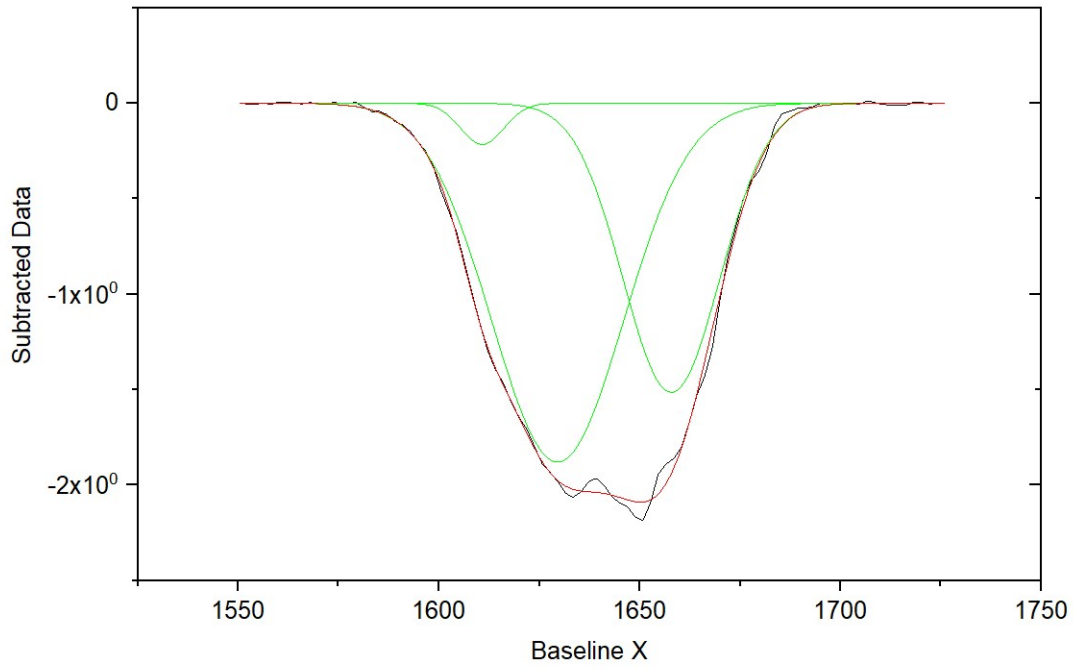
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!F"Pr" Date:10/5/2022

BaseLine:Line

Chi^2=1.09379E-03 Adj. R-Square=9.98427E-01 # of Data Points=92

SS=9.07842E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-77.37969	38.68013	-1.87935	1629.56046	-61.32752
2	Gaussian	-45.87476	28.45364	-1.51462	1657.90435	-36.35819
3	Gaussian	-2.92004	12.69907	-0.21602	1610.79126	-2.31429

Figure S88. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

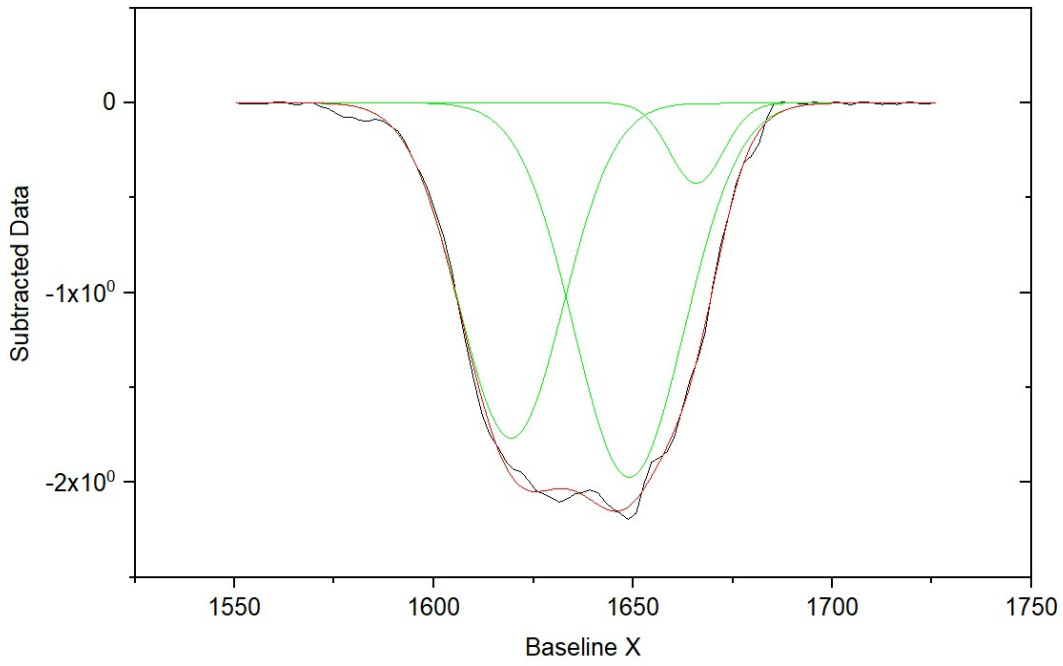
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!G"Nd" Date:10/5/2022

BaseLine:Line

Chi^2=1.37711E-03 Adj. R-Square=9.98174E-01 # of Data Points=92

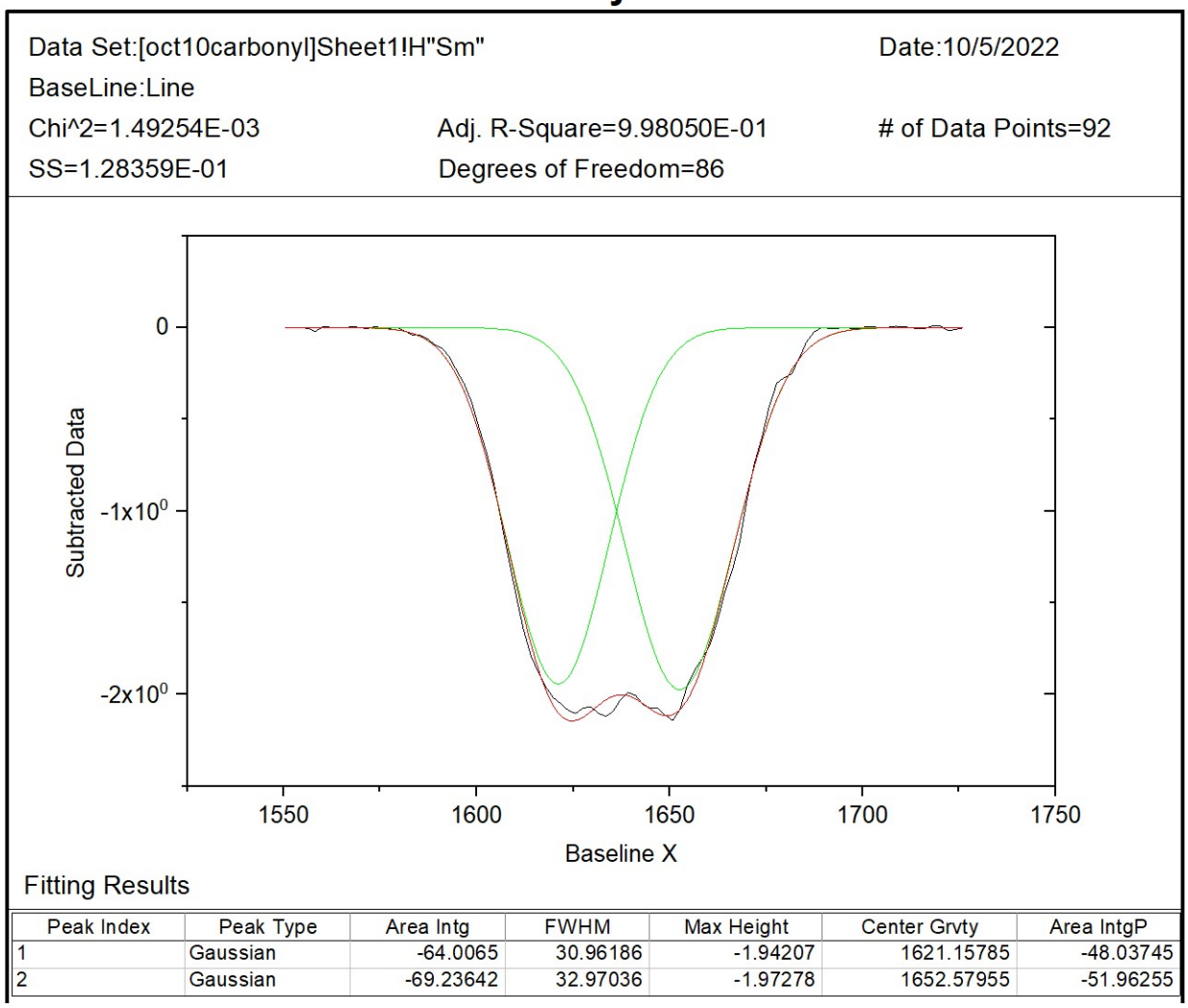
SS=1.14300E-01 Degrees of Freedom=83



Fitting Results

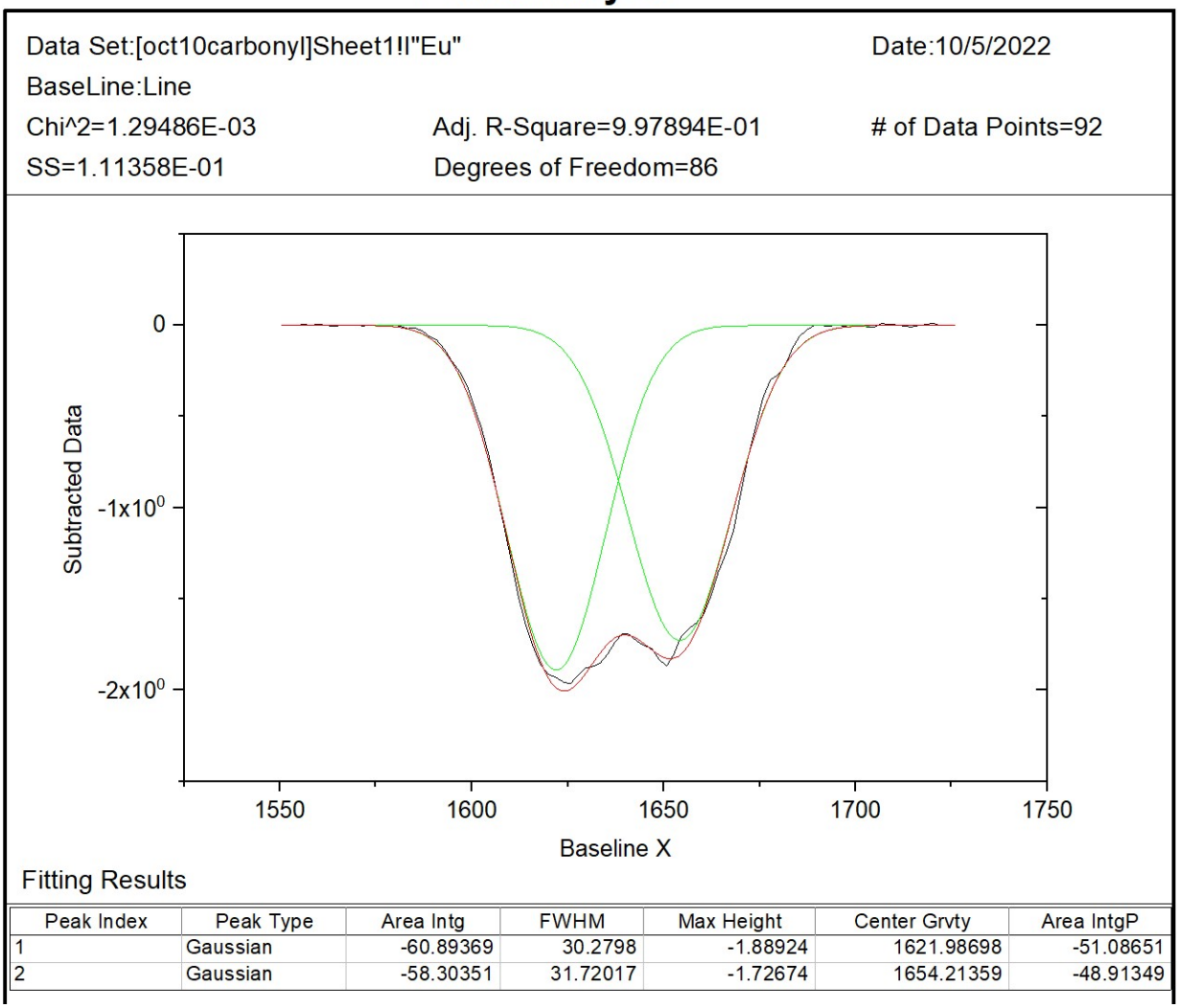
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-68.37624	32.55632	-1.97305	1649.03769	-51.33412
2	Gaussian	-7.15303	15.84334	-0.42414	1665.90623	-5.37021
3	Gaussian	-57.66916	30.66367	-1.7668	1619.43621	-43.29567

Figure S89. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-64.0065	30.96186	-1.94207	1621.15785	-48.03745
2	Gaussian	-69.23642	32.97036	-1.97278	1652.57955	-51.96255

Figure S90. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-60.89369	30.2798	-1.88924	1621.98698	-51.08651
2	Gaussian	-58.30351	31.72017	-1.72674	1654.21359	-48.91349

Figure S91. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

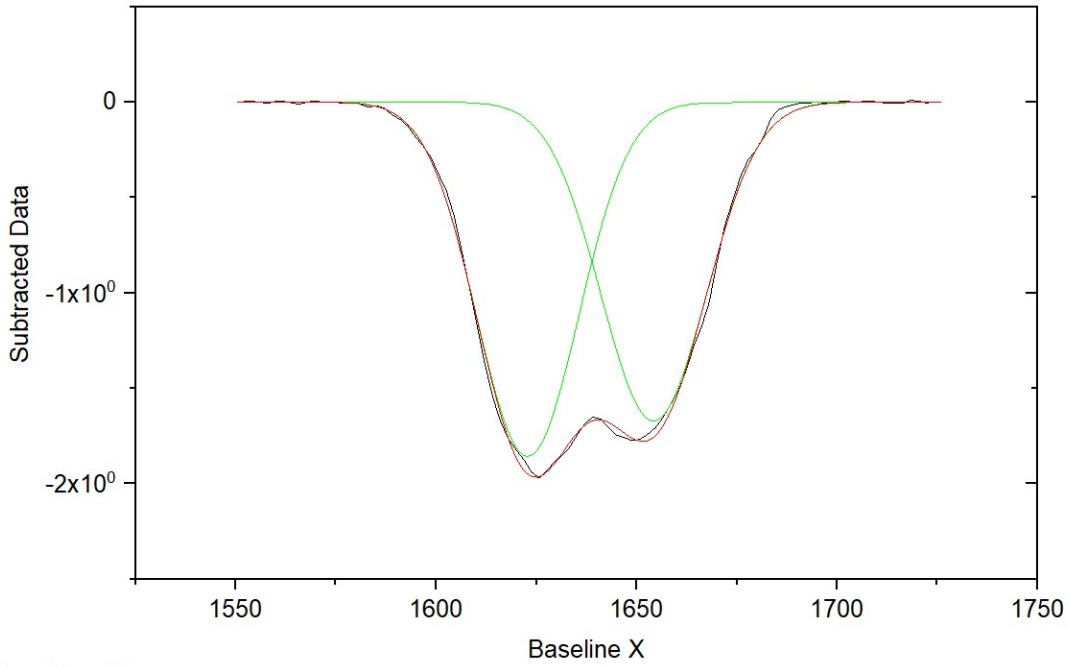
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!J"Gd" Date:10/5/2022

BaseLine:Line

Chi^2=7.50950E-04 Adj. R-Square=9.98708E-01 # of Data Points=92

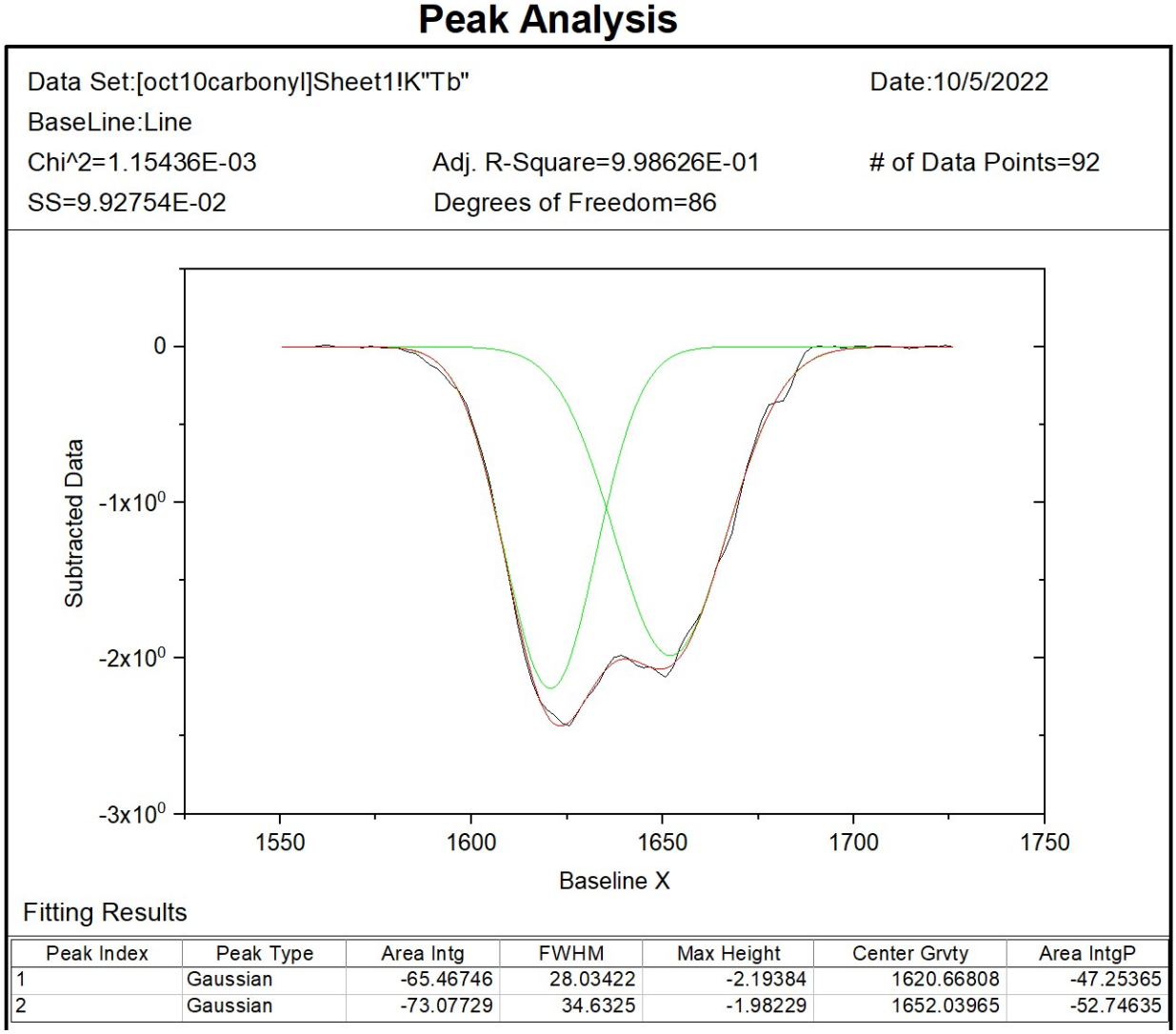
SS=6.45817E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-59.04898	29.8894	-1.85594	1622.82527	-51.85202
2	Gaussian	-54.83082	30.8325	-1.67064	1654.25813	-48.14798

Figure S92. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-65.46746	28.03422	-2.19384	1620.66808	-47.25365
2	Gaussian	-73.07729	34.6325	-1.98229	1652.03965	-52.74635

Figure S93. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

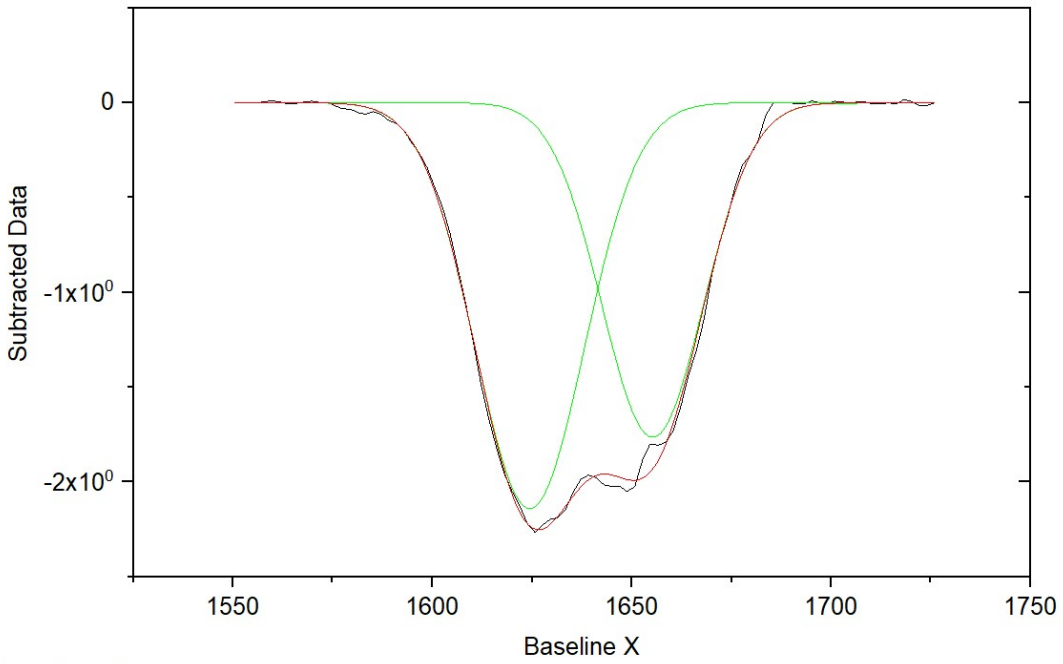
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!L"Dy" Date:10/5/2022

BaseLine:Line

Chi^2=1.38110E-03 Adj. R-Square=9.98169E-01 # of Data Points=92

SS=1.18774E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-73.2561	32.14543	-2.14088	1624.45451	-56.59849
2	Gaussian	-56.17509	29.90832	-1.76449	1655.25232	-43.40151

Figure S94. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.

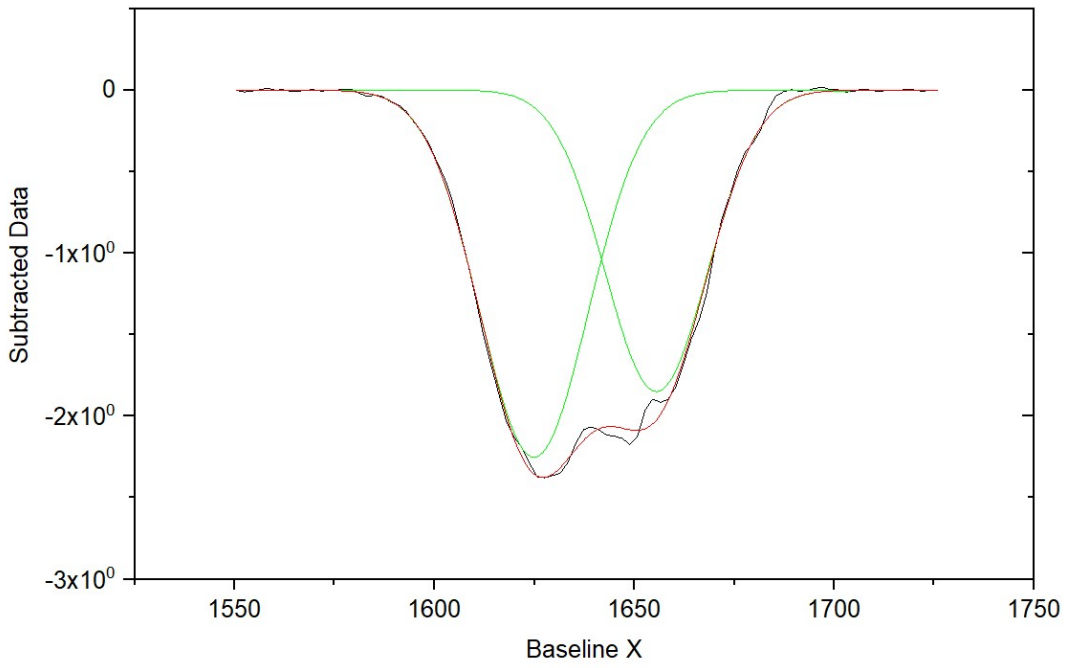
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!M"Ho" Date:10/5/2022

BaseLine:Line

Chi^2=1.49111E-03 Adj. R-Square=9.98216E-01 # of Data Points=92

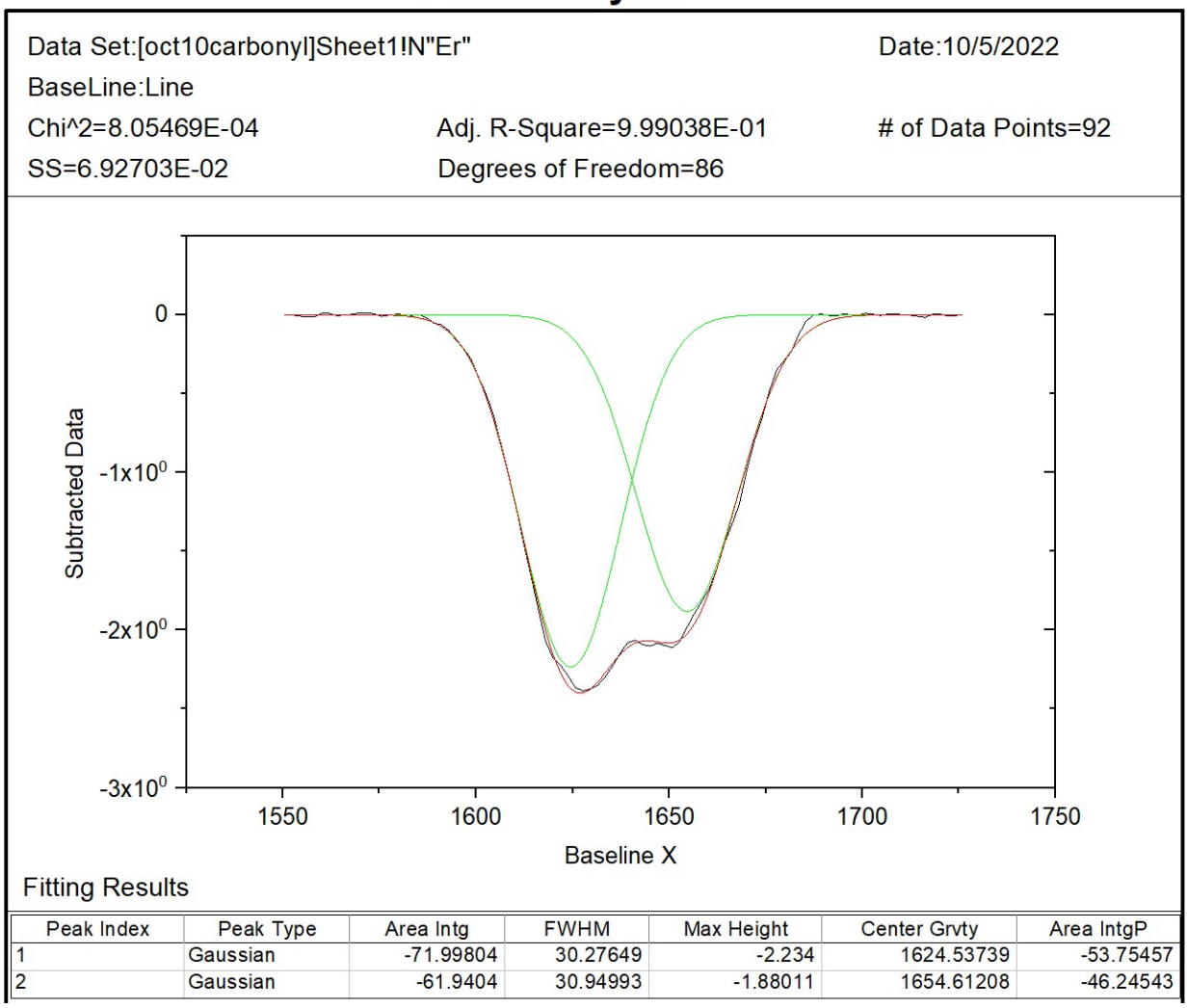
SS=1.28235E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-76.36909	31.87257	-2.25096	1624.93606	-56.36613
2	Gaussian	-59.11847	30.0511	-1.84812	1655.53875	-43.63387

Figure S95. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-71.99804	30.27649	-2.234	1624.53739	-53.75457
2	Gaussian	-61.9404	30.94993	-1.88011	1654.61208	-46.24543

Figure S96. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.

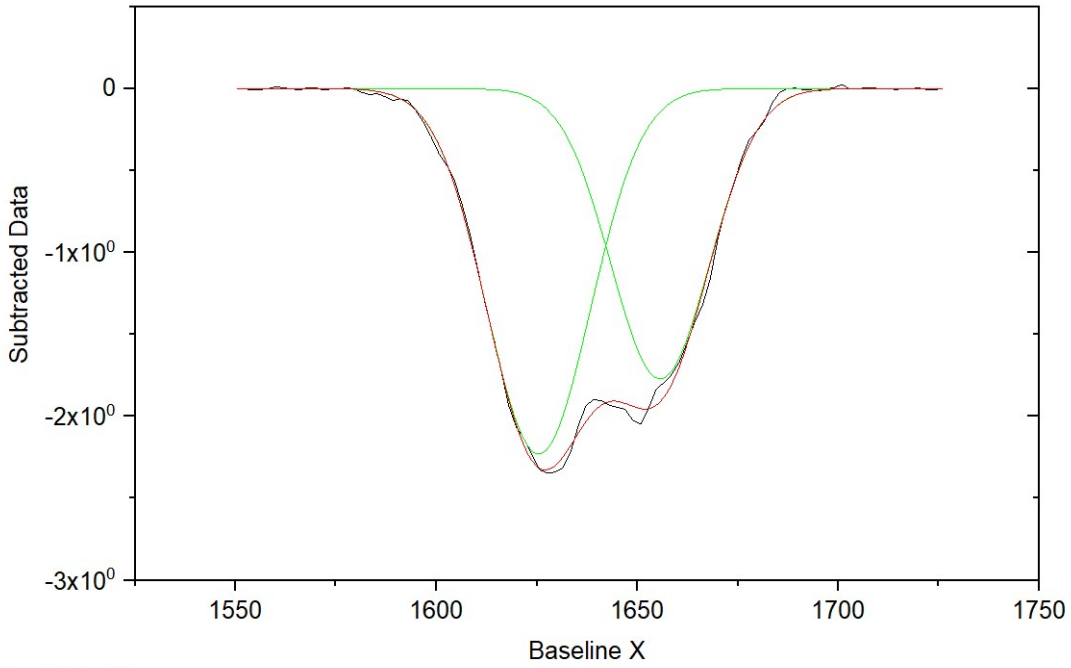
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!O"Tm" Date:10/5/2022

BaseLine:Line

Chi^2=1.34711E-03 Adj. R-Square=9.98223E-01 # of Data Points=92

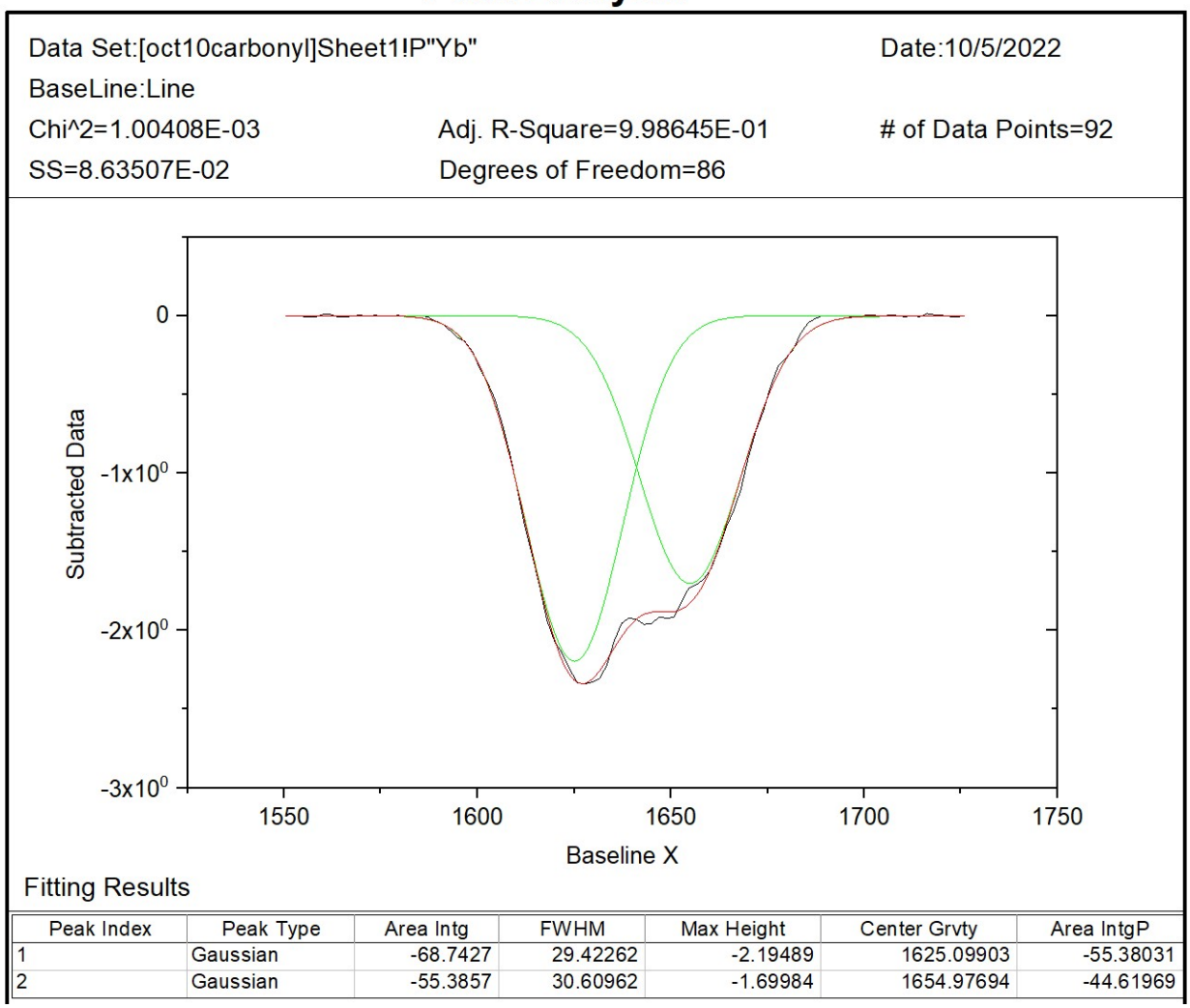
SS=1.15852E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-71.76681	30.23726	-2.22971	1625.44369	-56.9113
2	Gaussian	-54.33611	28.82324	-1.77098	1655.69206	-43.0887

Figure S97. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-68.7427	29.42262	-2.19489	1625.09903	-55.38031
2	Gaussian	-55.3857	30.60962	-1.69984	1654.97694	-44.61969

Figure S98. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.

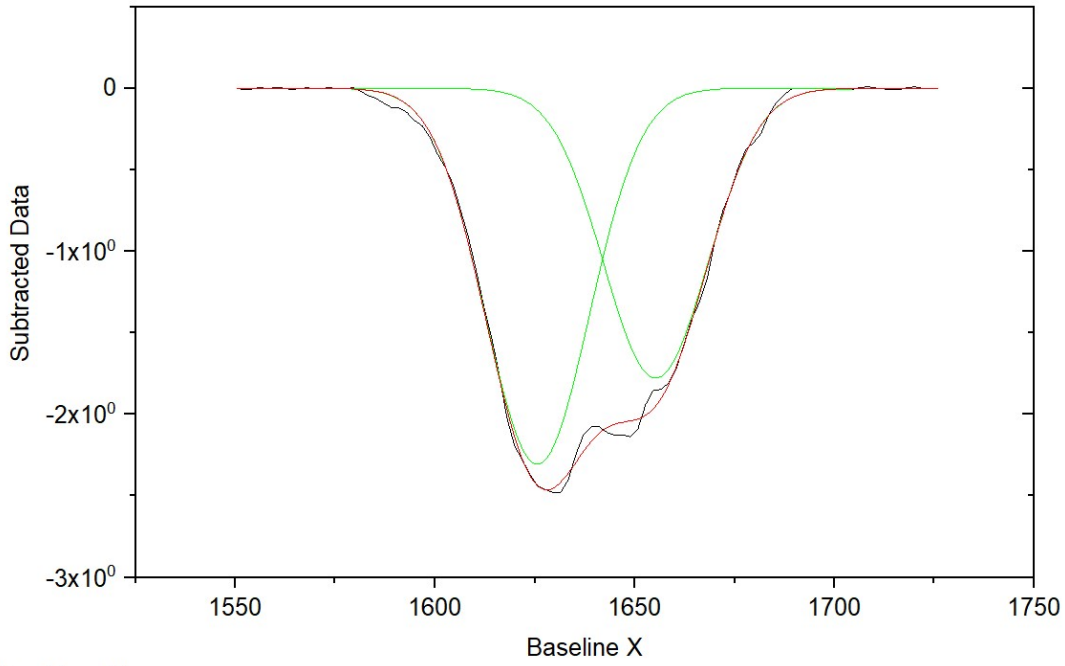
Peak Analysis

Data Set:[oct10carbonyl]Sheet1!Q"Lu" Date:10/5/2022

BaseLine:Line

Chi^2=1.56252E-03 Adj. R-Square=9.98128E-01 # of Data Points=92

SS=1.34377E-01 Degrees of Freedom=86

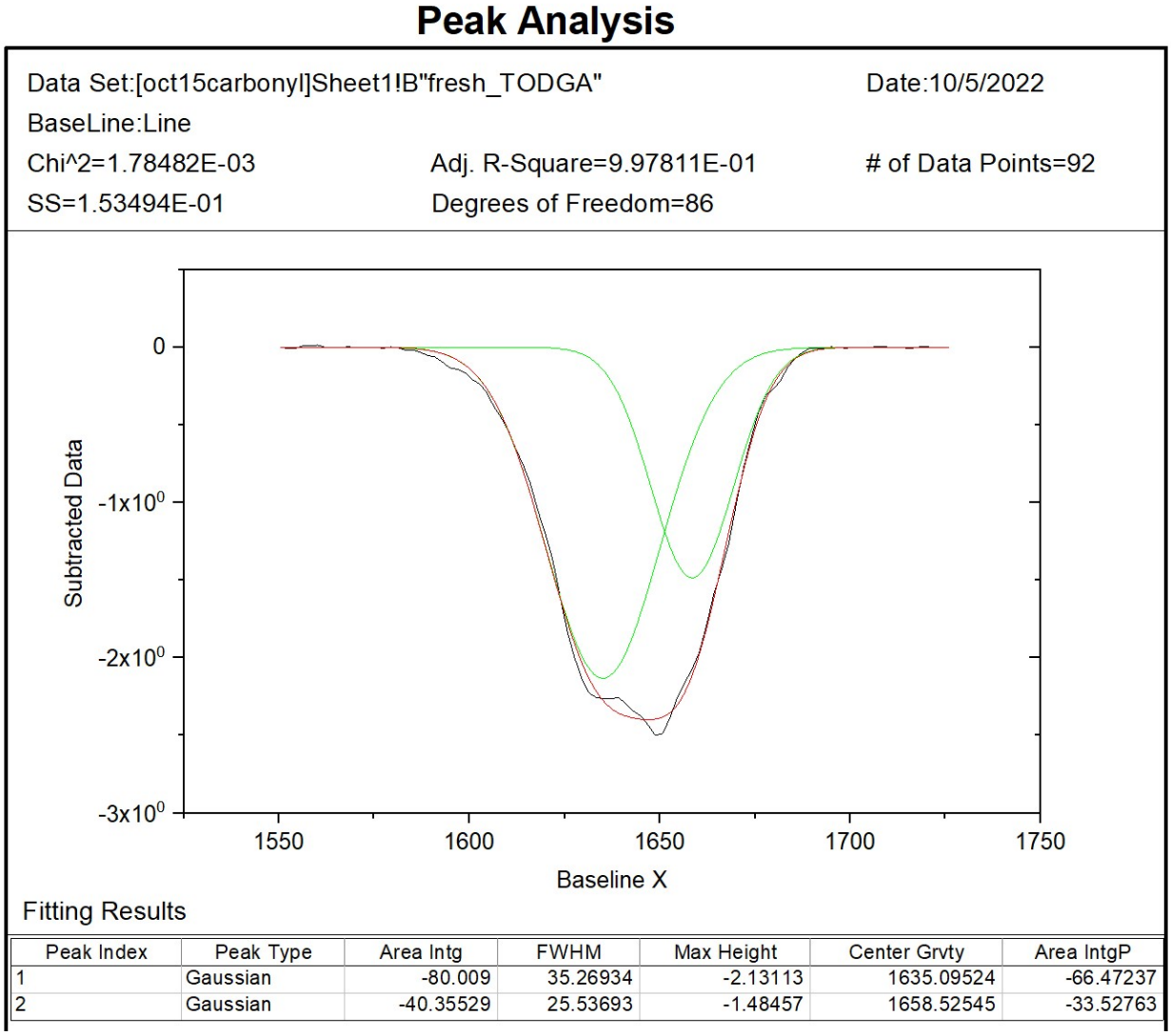


Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-75.08683	30.60236	-2.30503	1625.62888	-56.46472
2	Gaussian	-57.89326	30.60298	-1.77718	1655.26488	-43.53528

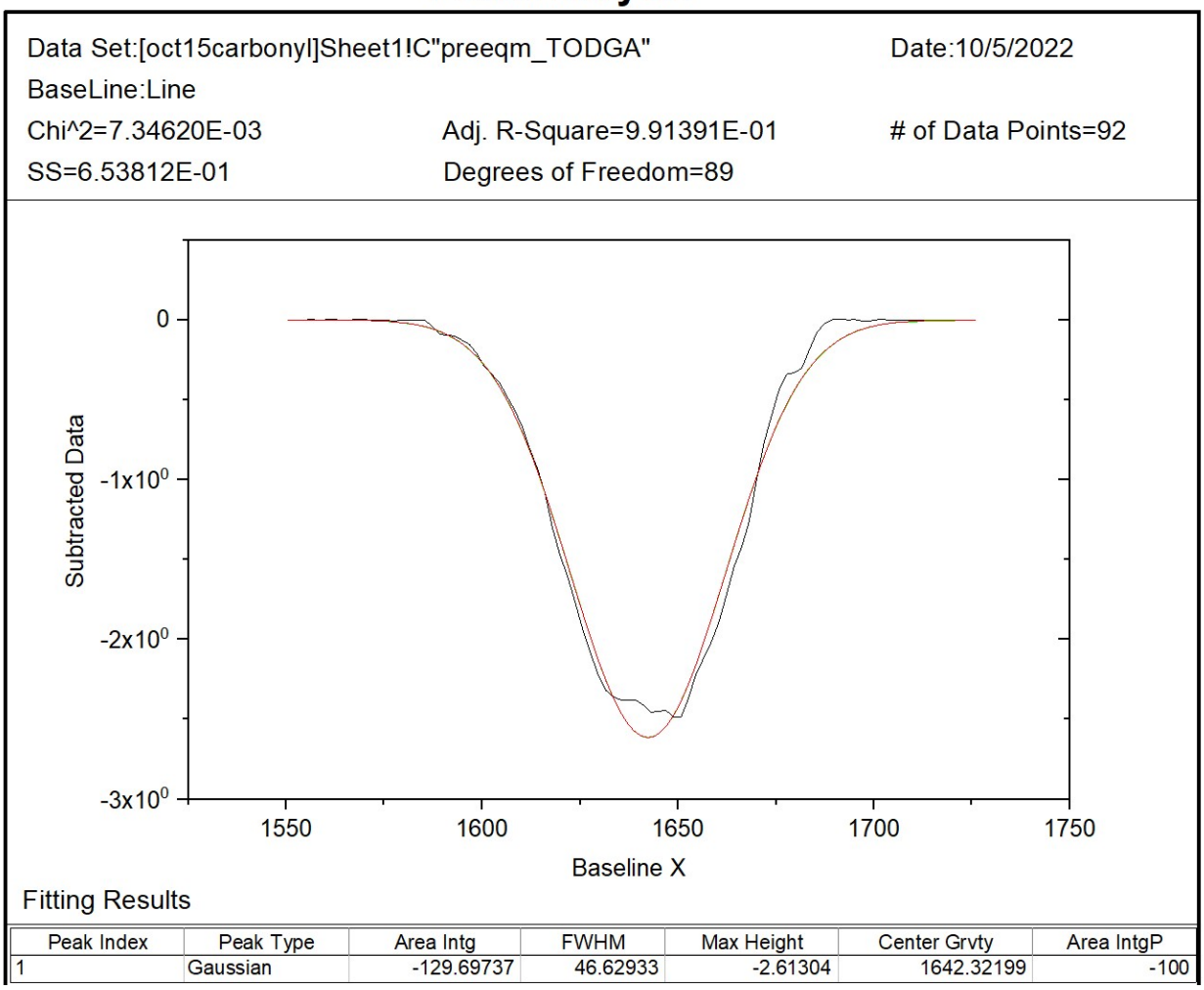
Figure S99. Peak analysis via OriginLab for 0.04 M TODGA with 10 vol% 1-octanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

15 vol% 1-octanol



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-80.009	35.26934	-2.13113	1635.09524	-66.47237
2	Gaussian	-40.35529	25.53693	-1.48457	1658.52545	-33.52763

Figure S100. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 15 vol% 1-octanol in n-dodecane.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-129.69737	46.62933	-2.61304	1642.32199	-100

Figure S101. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 1 M HNO_3.

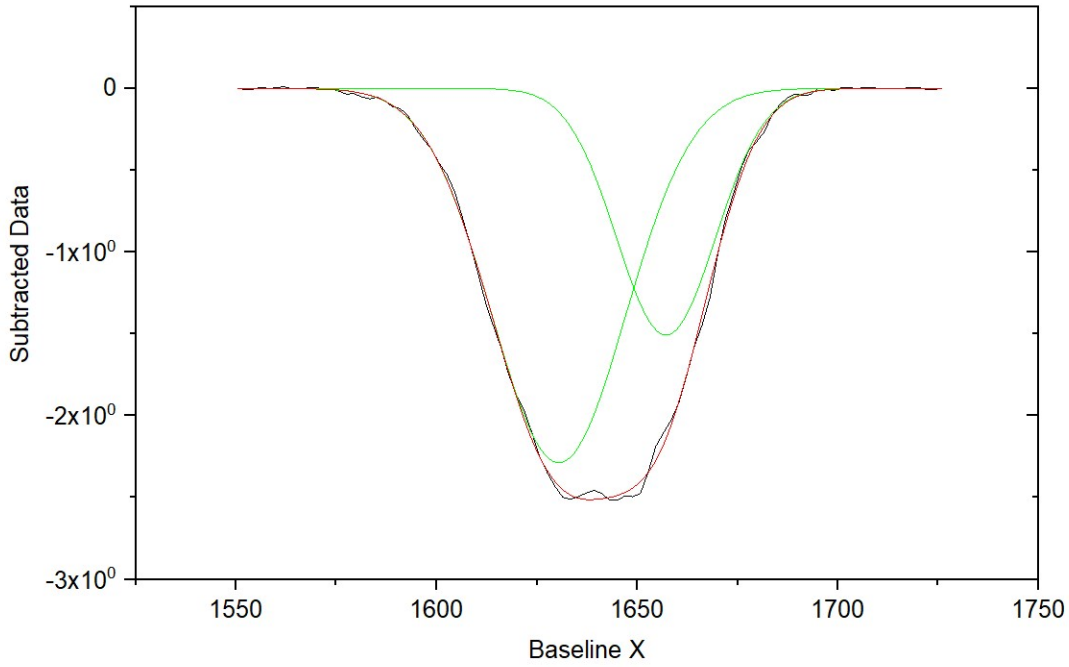
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!D"La" Date:10/5/2022

BaseLine:Line

Chi^2=8.05702E-04 Adj. R-Square=9.99143E-01 # of Data Points=92

SS=6.92904E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-95.49319	39.2348	-2.28649	1630.46023	-67.24021
2	Gaussian	-46.5248	29.00502	-1.50688	1657.17919	-32.75979

Figure S102. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

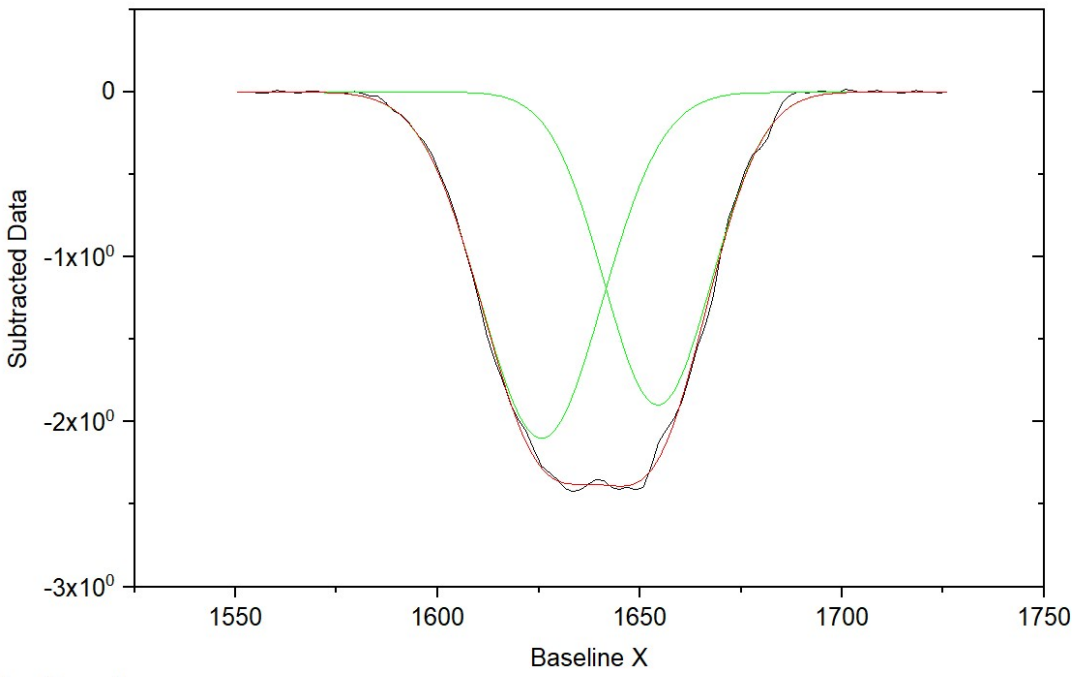
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!E"Ce" Date:10/5/2022

BaseLine:Line

Chi^2=1.04103E-03 Adj. R-Square=9.98860E-01 # of Data Points=92

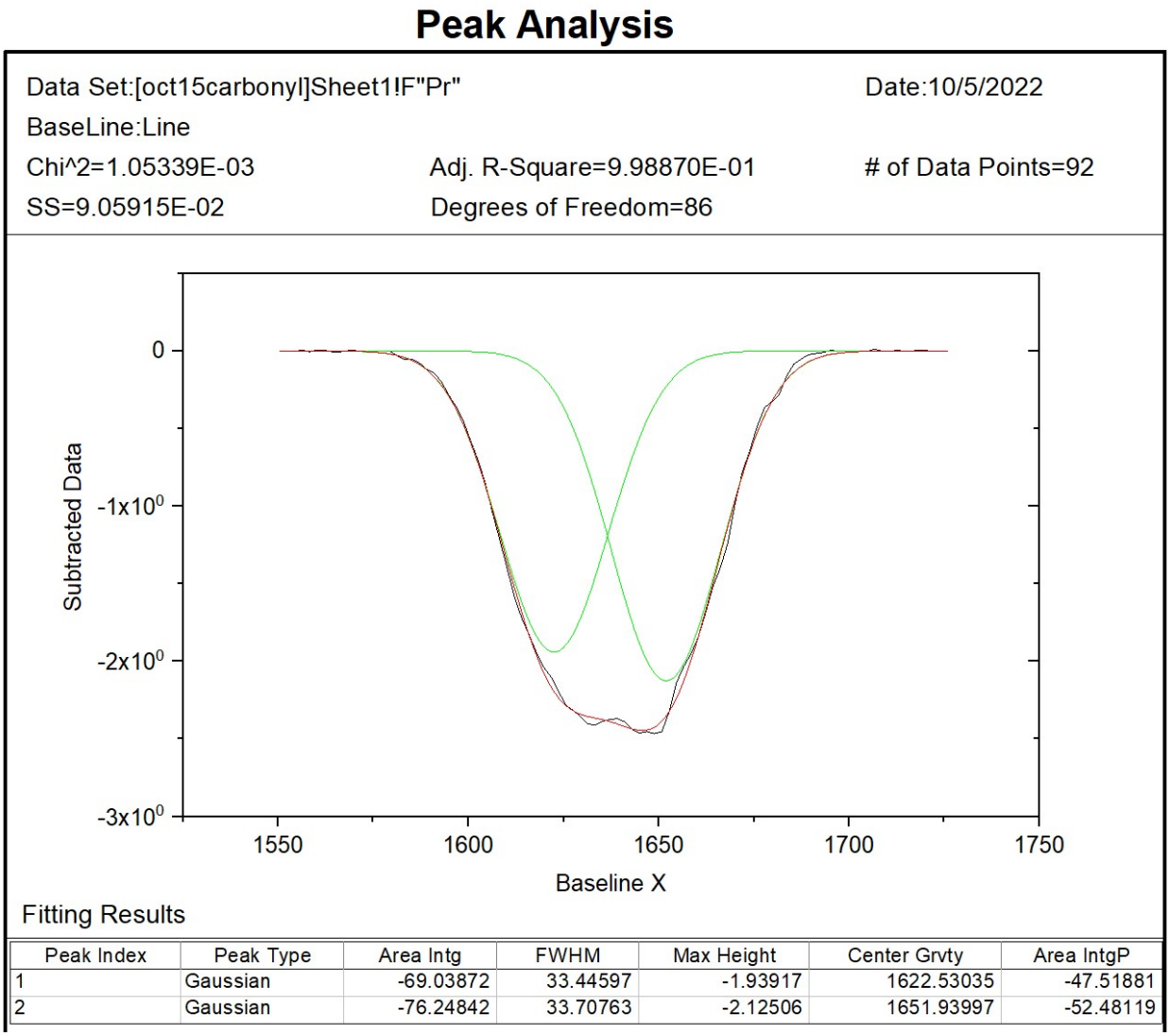
SS=8.95283E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-78.86432	35.29859	-2.0989	1625.68444	-55.58049
2	Gaussian	-63.02776	31.20894	-1.89723	1654.41994	-44.41951

Figure S103. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-69.03872	33.44597	-1.93917	1622.53035	-47.51881
2	Gaussian	-76.24842	33.70763	-2.12506	1651.93997	-52.48119

Figure S104. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3..

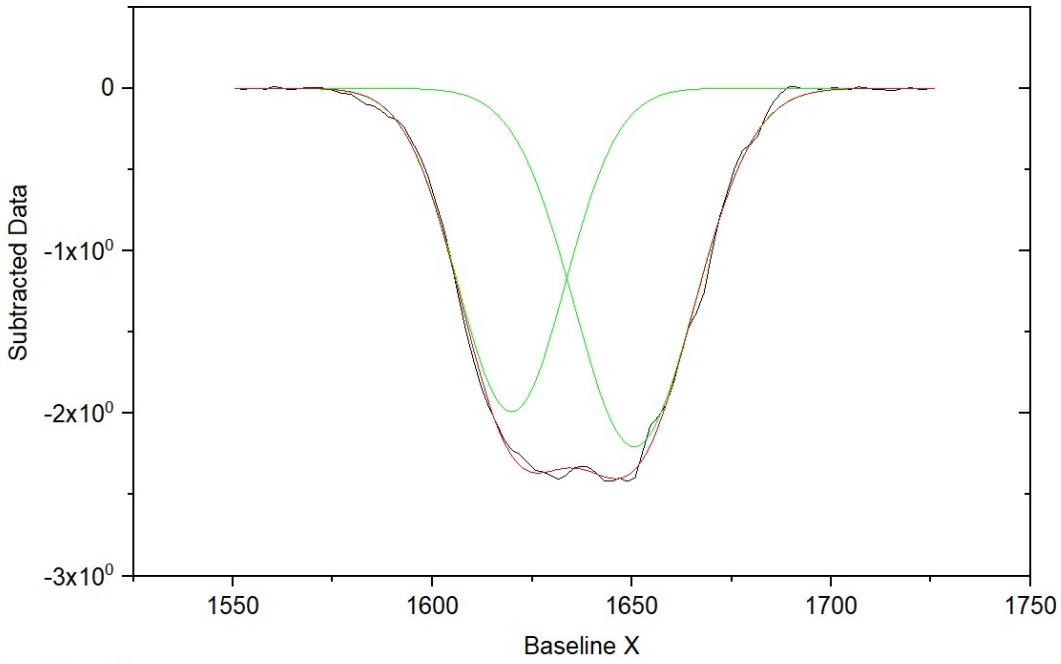
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!G"Nd" Date:10/5/2022

BaseLine:Line

Chi^2=1.60883E-03 Adj. R-Square=9.98303E-01 # of Data Points=92

SS=1.38359E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-67.00132	31.6371	-1.98955	1619.83672	-44.68301
2	Gaussian	-82.94677	35.35166	-2.20423	1650.61474	-55.31699

Figure S105. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.

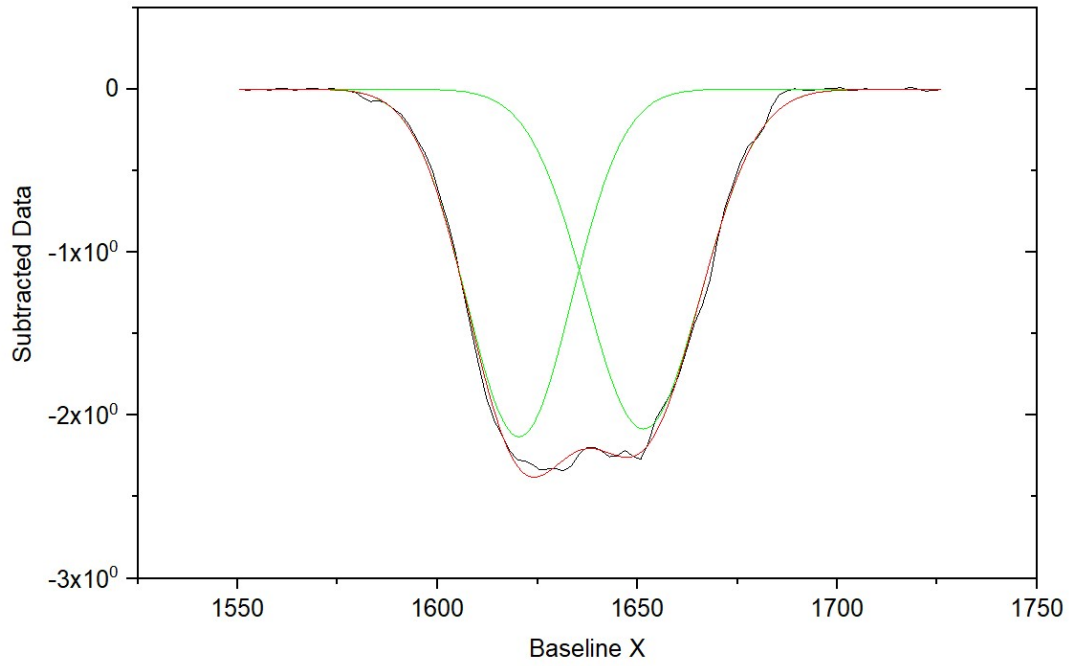
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!H"Sm" Date:10/5/2022

BaseLine:Line

Chi^2=1.44765E-03 Adj. R-Square=9.98399E-01 # of Data Points=92

SS=1.24498E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-70.27427	30.98414	-2.13071	1620.3914	-48.49412
2	Gaussian	-74.63872	33.6625	-2.08298	1651.5054	-51.50588

Figure S106. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

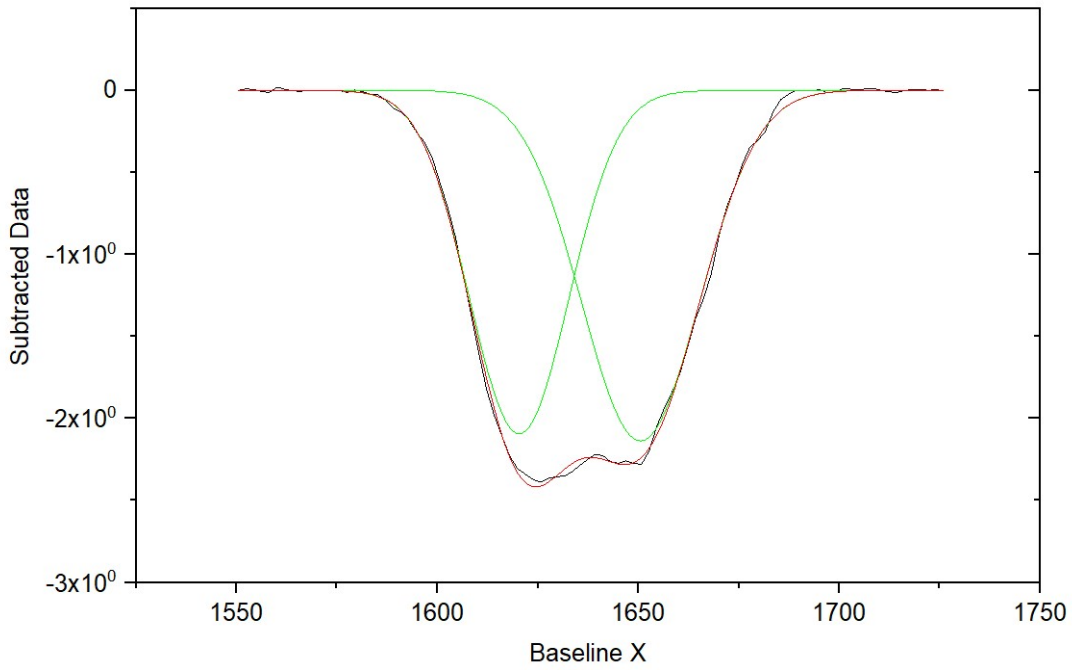
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!I"Eu" Date:10/5/2022

BaseLine:Line

Chi^2=8.43360E-04 Adj. R-Square=9.99082E-01 # of Data Points=92

SS=7.25290E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-64.85027	29.10982	-2.09286	1620.37308	-45.29746
2	Gaussian	-78.31509	34.43464	-2.13657	1650.53463	-54.70254

Figure S107. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

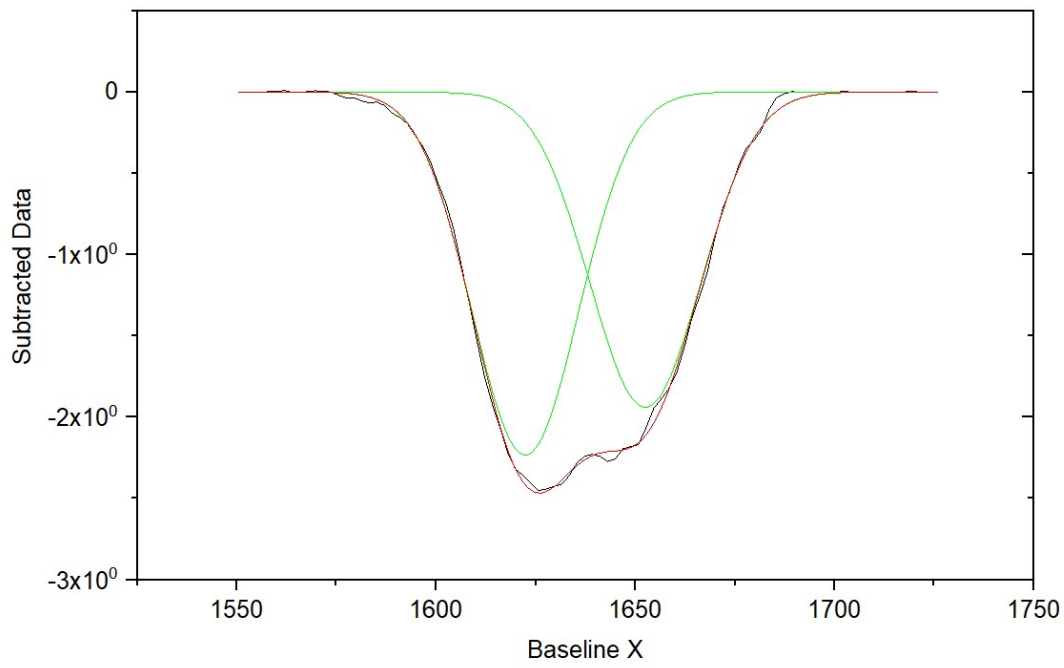
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!J"Gd" Date:10/5/2022

BaseLine:Line

Chi^2=9.12853E-04 Adj. R-Square=9.98990E-01 # of Data Points=92

SS=7.85053E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-74.64149	31.42447	-2.23141	1622.42664	-52.51535
2	Gaussian	-67.49121	32.70994	-1.93836	1652.5212	-47.48465

Figure S108. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.

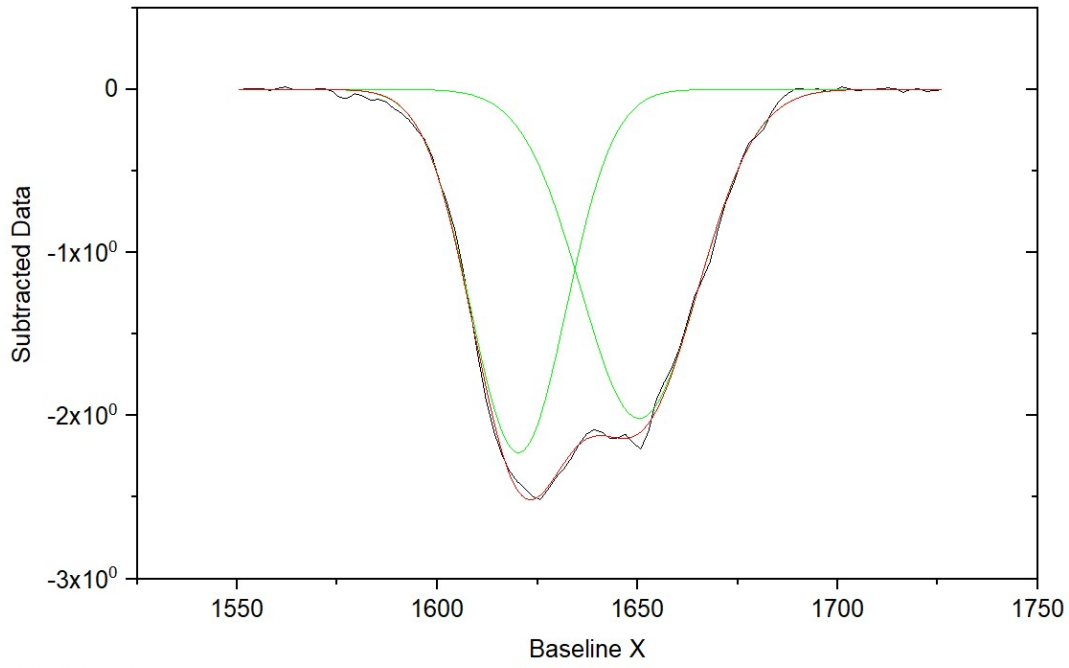
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!K"Tb" Date:10/5/2022

BaseLine:Line

Chi^2=1.18001E-03 Adj. R-Square=9.98677E-01 # of Data Points=92

SS=1.01481E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-66.29245	27.97764	-2.22598	1620.26771	-47.25014
2	Gaussian	-74.00862	34.47682	-2.01661	1650.46497	-52.74986

Figure S109. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

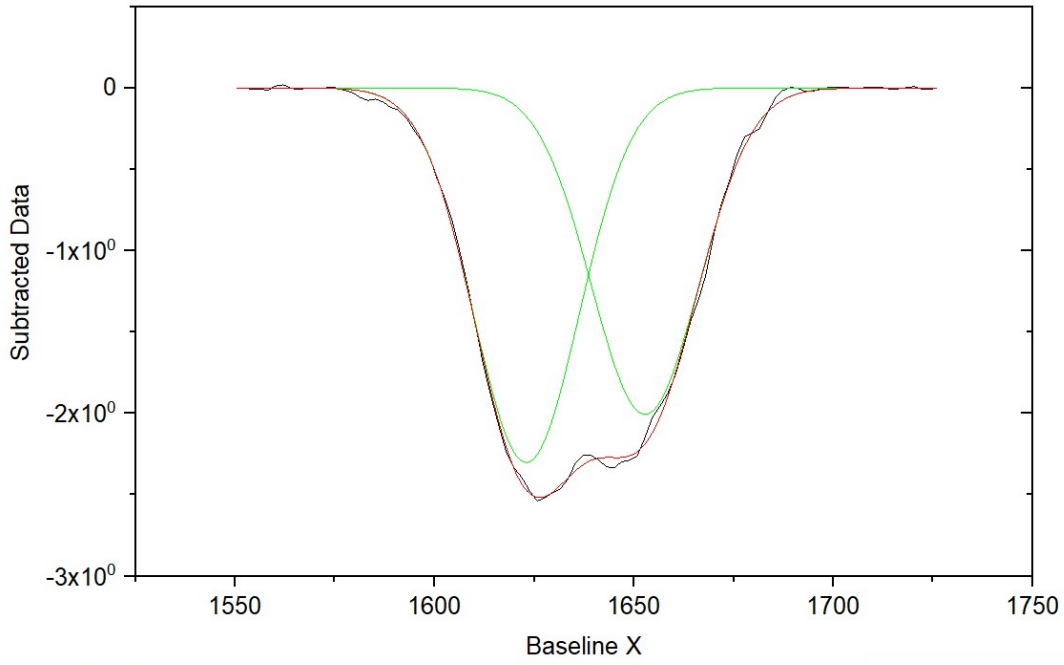
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!L"Dy" Date:10/5/2022

BaseLine:Line

Chi^2=9.51251E-04 Adj. R-Square=9.98994E-01 # of Data Points=92

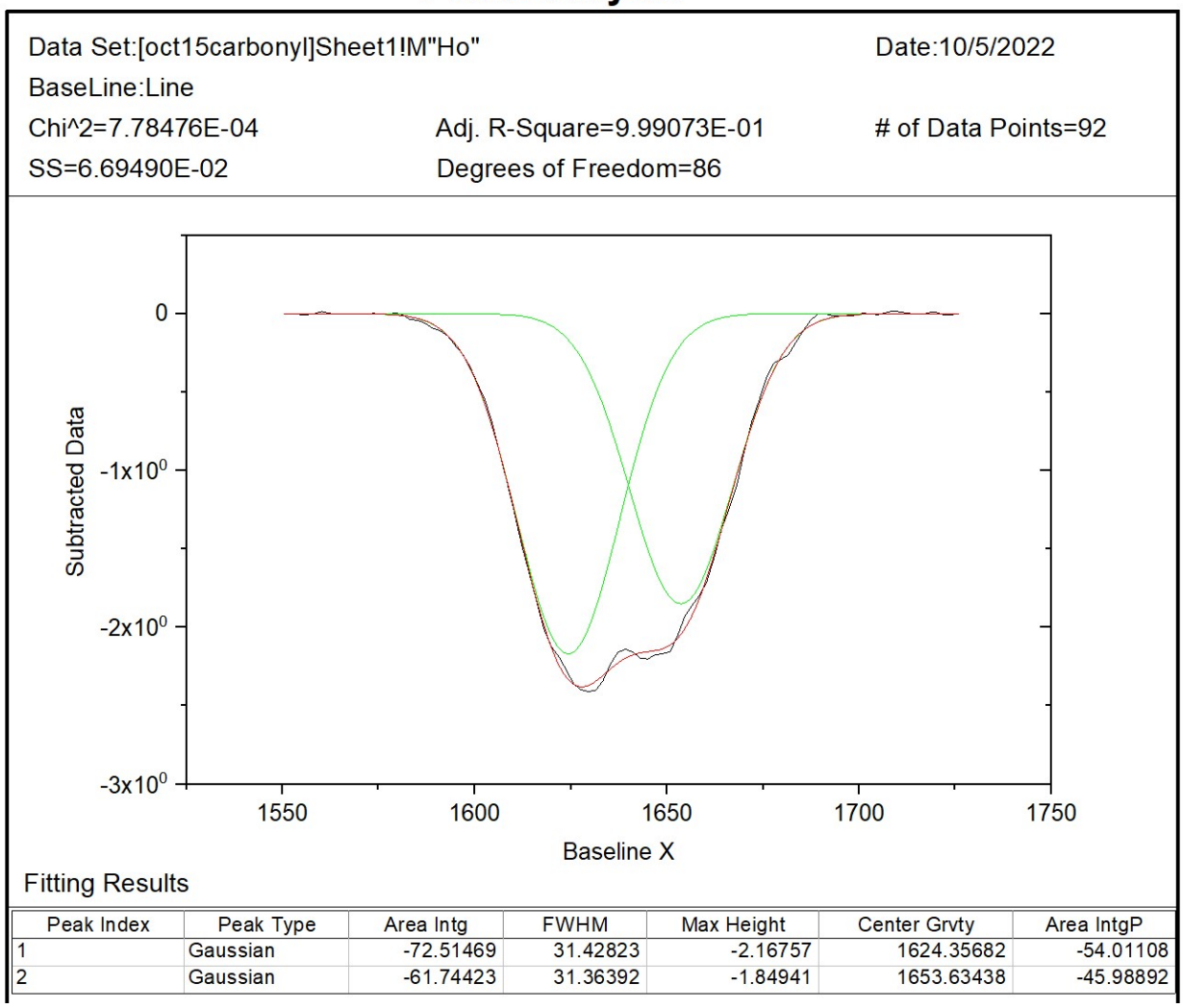
SS=8.18076E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-76.22148	31.12471	-2.30059	1623.03313	-53.03596
2	Gaussian	-67.49513	31.62158	-2.0052	1652.81079	-46.96404

Figure S110. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-72.51469	31.42823	-2.16757	1624.35682	-54.01108
2	Gaussian	-61.74423	31.36392	-1.84941	1653.63438	-45.98892

Figure S111. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.

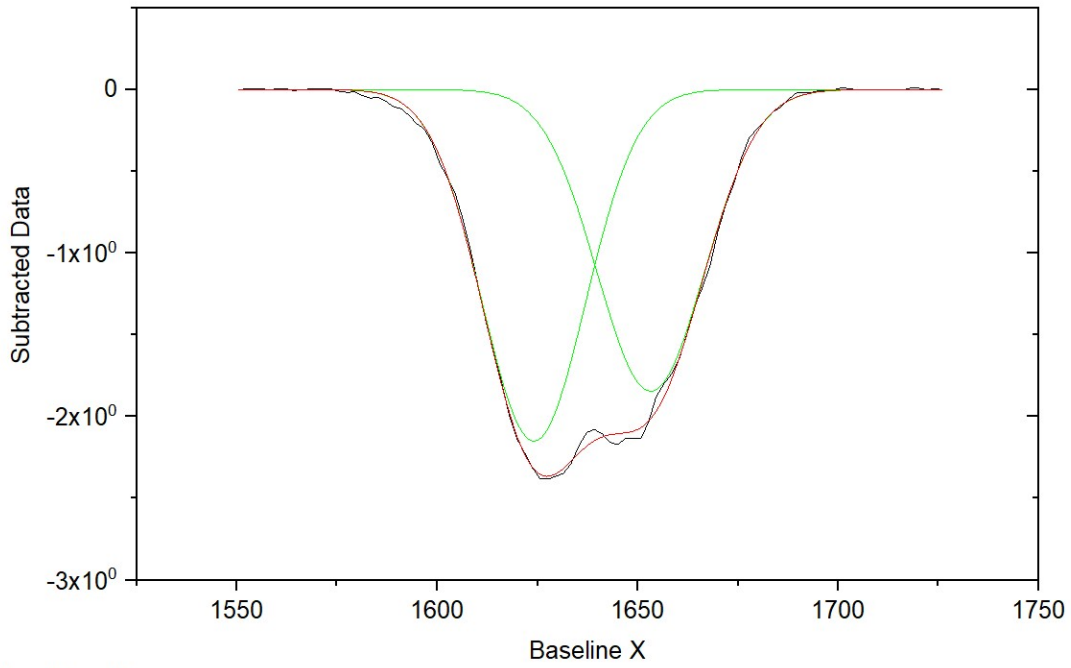
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!N"Er" Date:10/5/2022

BaseLine:Line

Chi^2=9.12093E-04 Adj. R-Square=9.98878E-01 # of Data Points=92

SS=7.84400E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-69.47885	30.37507	-2.14884	1624.10998	-52.90636
2	Gaussian	-61.84534	31.4963	-1.84466	1653.24692	-47.09364

Figure S112. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.

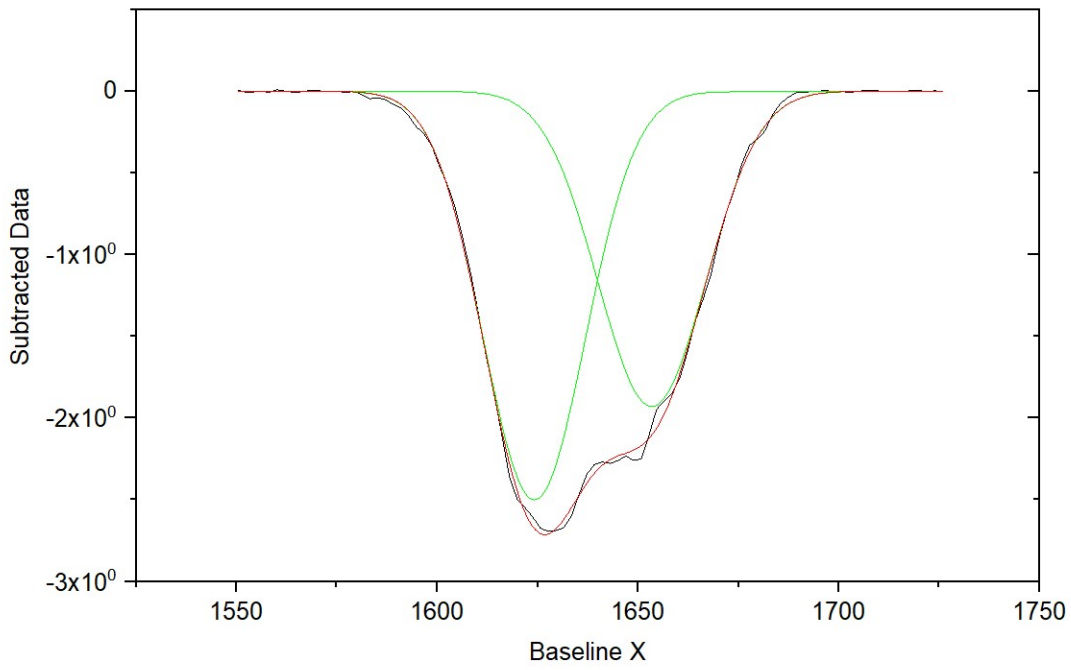
Peak Analysis

Data Set:[oct15carbonyl]Sheet1!O"Tm" Date:10/5/2022

BaseLine:Line

Chi^2=1.01883E-03 Adj. R-Square=9.98979E-01 # of Data Points=92

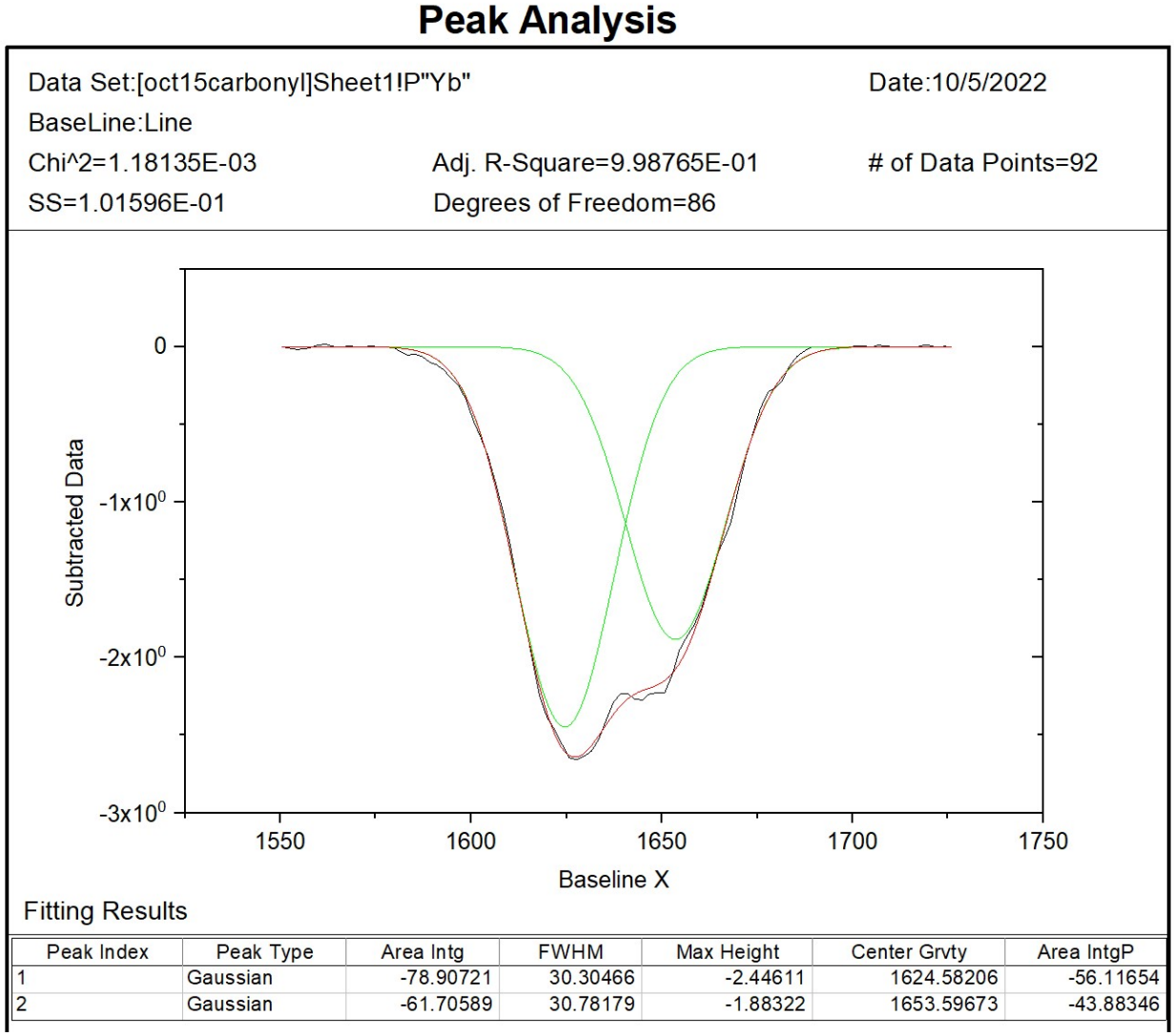
SS=8.76197E-02 Degrees of Freedom=86



Fitting Results

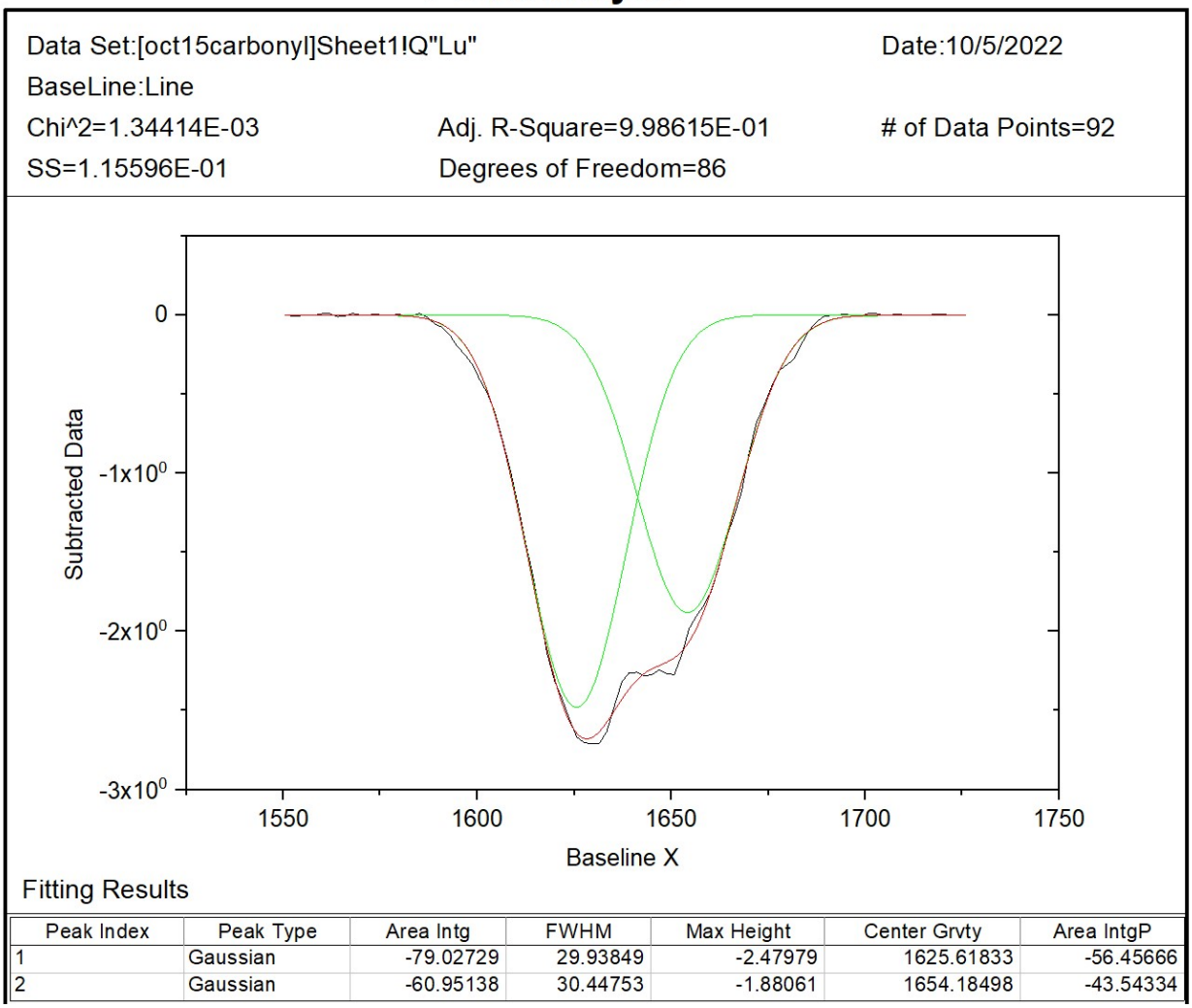
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-79.53674	29.88331	-2.50039	1624.18903	-55.11414
2	Gaussian	-64.77604	31.54704	-1.92896	1653.46156	-44.88586

Figure S113. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-78.90721	30.30466	-2.44611	1624.58206	-56.11654
2	Gaussian	-61.70589	30.78179	-1.88322	1653.59673	-43.88346

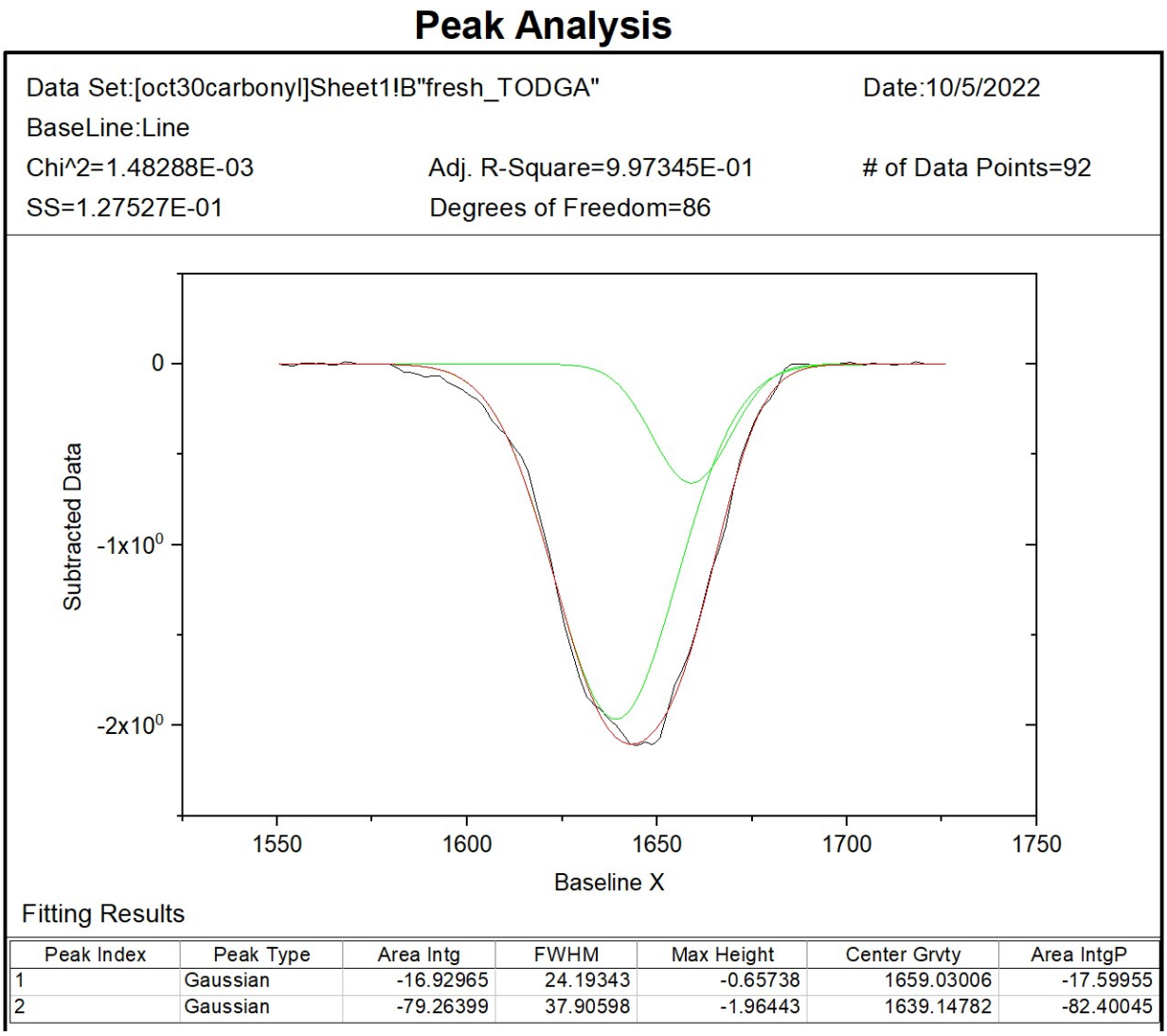
Figure S114. Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-79.02729	29.93849	-2.47979	1625.61833	-56.45666
2	Gaussian	-60.95138	30.44753	-1.88061	1654.18498	-43.54334

Figure S115 Peak analysis via OriginLab for 0.04 M TODGA with 15 vol% 1-octanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

30 vol% 1-octanol



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-16.92965	24.19343	-0.65738	1659.03006	-17.59955
2	Gaussian	-79.26399	37.90598	-1.96443	1639.14782	-82.40045

Figure S116. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 30 vol% 1-octanol in n-dodecane.

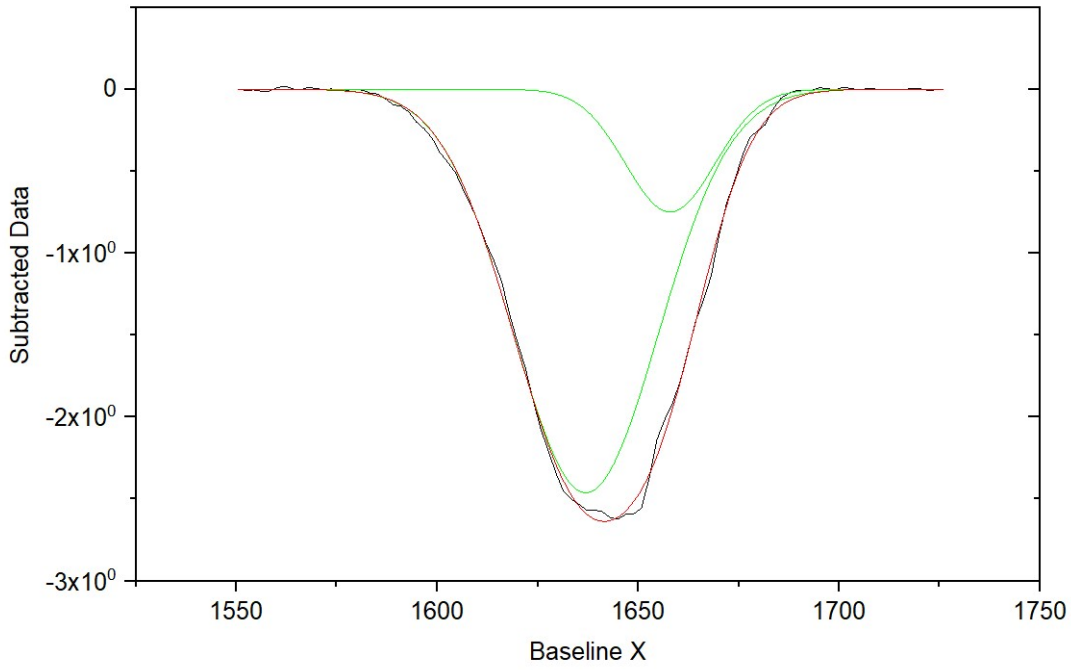
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!C"preeqm_TODGA" Date:10/5/2022

BaseLine:Line

Chi^2=1.28691E-03 Adj. R-Square=9.98593E-01 # of Data Points=92

SS=1.10674E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-20.88452	26.22923	-0.74801	1657.96844	-15.81081
2	Gaussian	-111.20566	42.44341	-2.46142	1636.98686	-84.18919

Figure S117. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 1 M HNO_3.

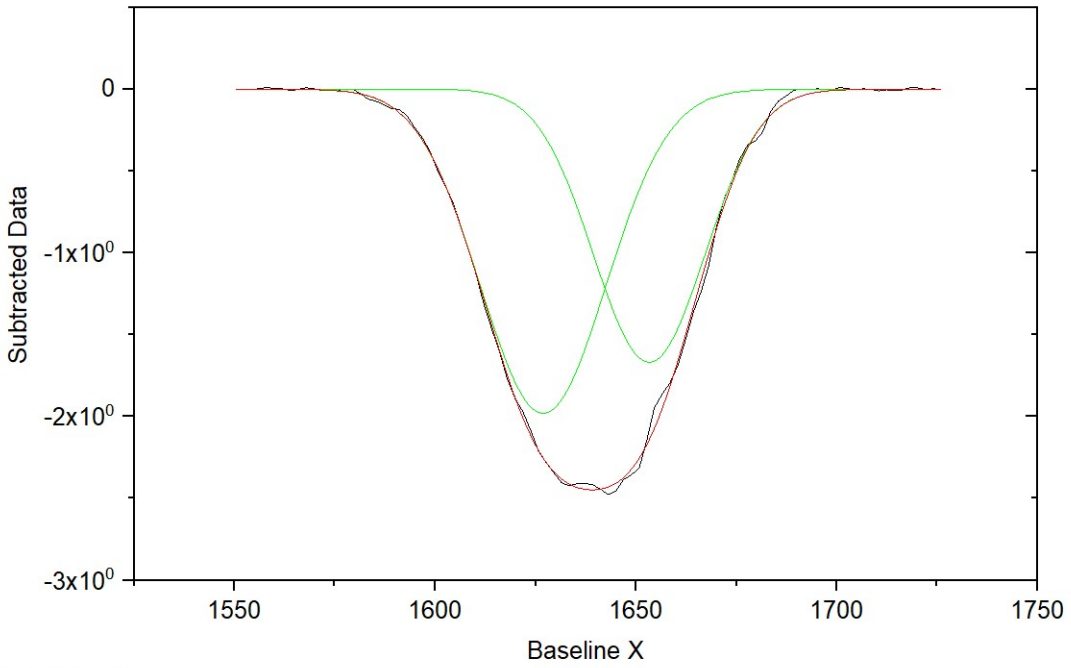
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!D"La" Date:10/5/2022

BaseLine:Line

Chi^2=8.84071E-04 Adj. R-Square=9.98977E-01 # of Data Points=92

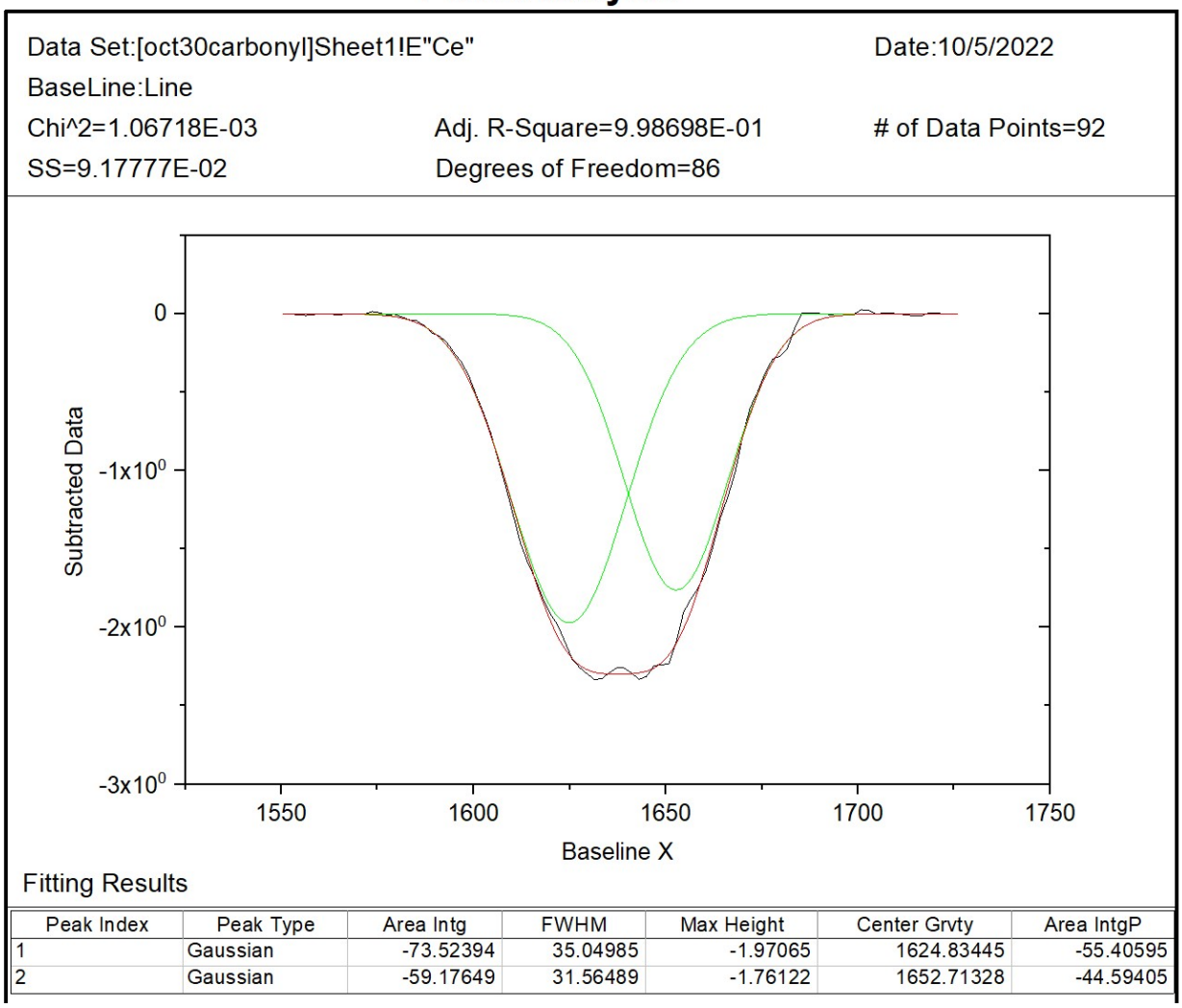
SS=7.60301E-02 Degrees of Freedom=86



Fitting Results

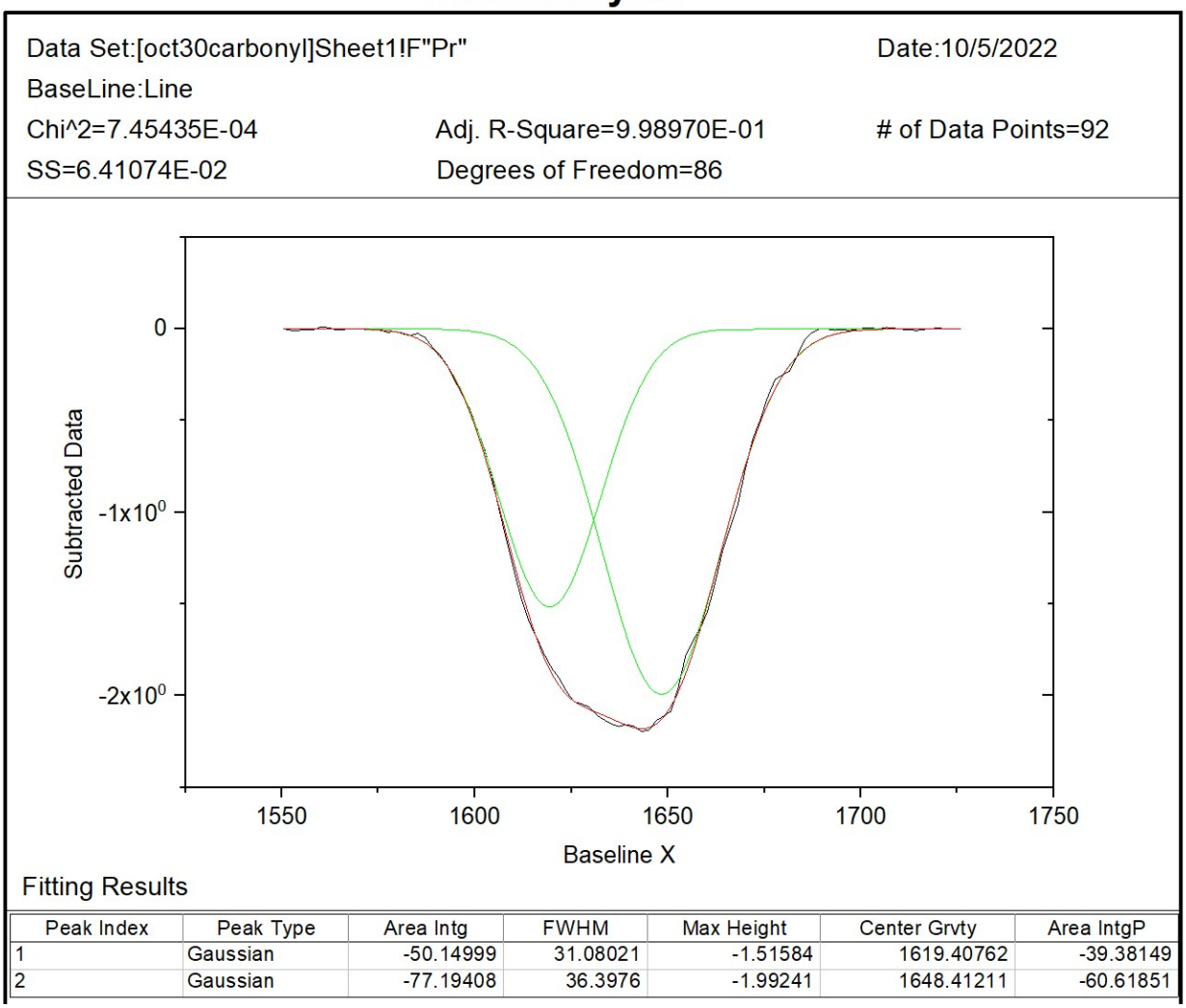
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-77.55856	36.79992	-1.97993	1626.91029	-57.19138
2	Gaussian	-58.05377	32.70802	-1.66742	1653.31908	-42.80862

Figure S118. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-73.52394	35.04985	-1.97065	1624.83445	-55.40595
2	Gaussian	-59.17649	31.56489	-1.76122	1652.71328	-44.59405

Figure S119. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-50.14999	31.08021	-1.51584	1619.40762	-39.38149
2	Gaussian	-77.19408	36.3976	-1.99241	1648.41211	-60.61851

Figure S120. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

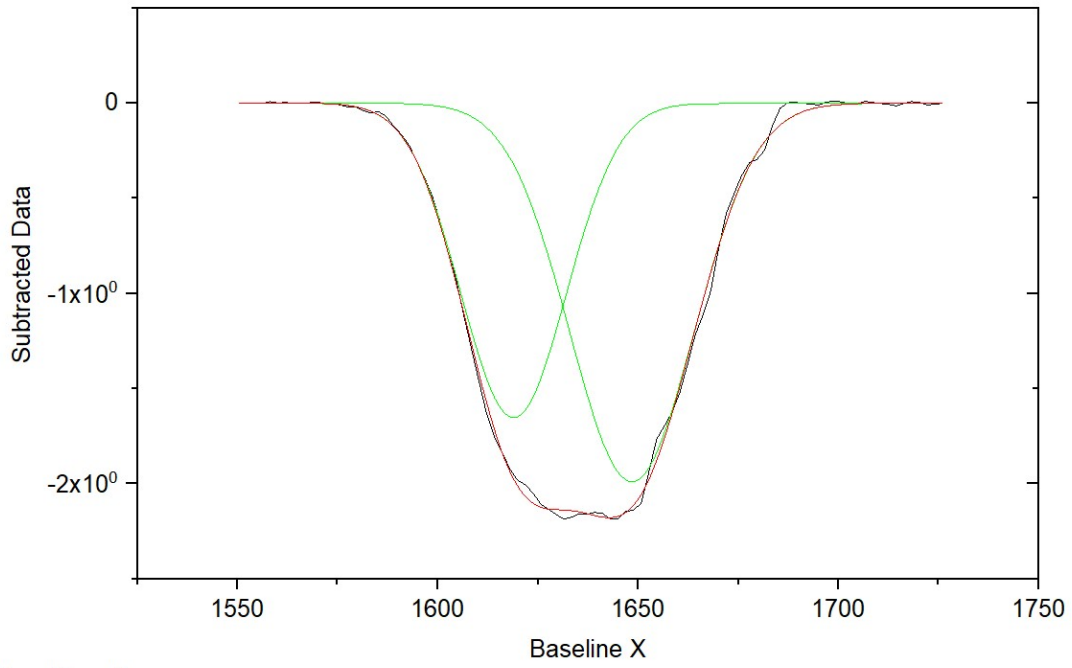
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!G"Nd" Date:10/5/2022

BaseLine:Line

Chi^2=1.12718E-03 Adj. R-Square=9.98514E-01 # of Data Points=92

SS=9.69375E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-54.44566	30.9488	-1.65267	1618.95123	-41.35924
2	Gaussian	-77.1952	36.45771	-1.98916	1648.4693	-58.64076

Figure S121. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.

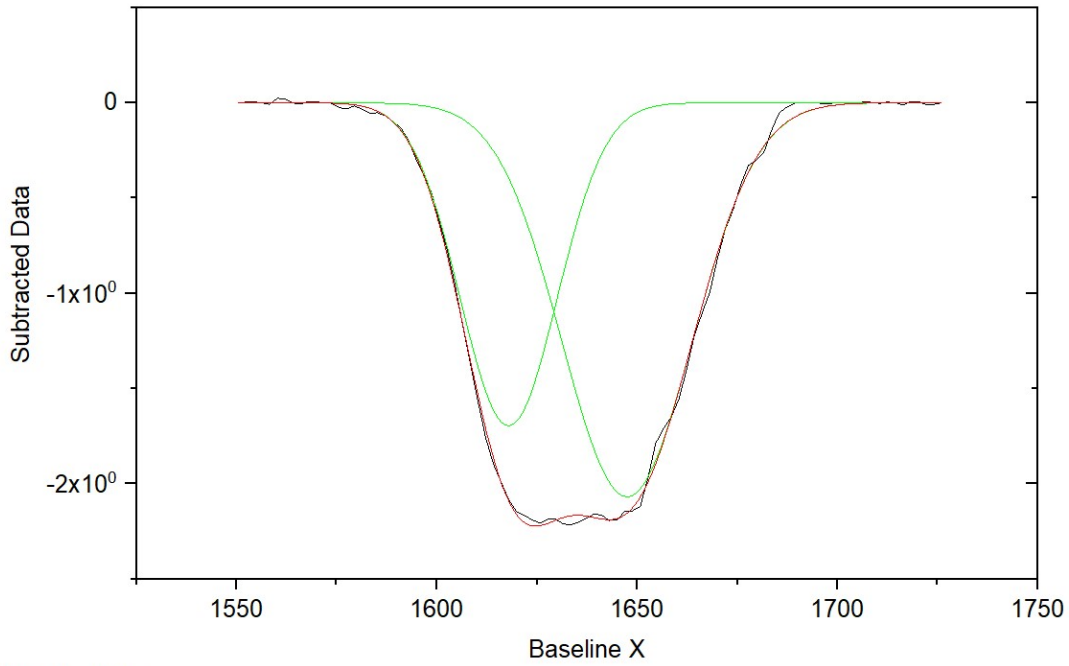
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!H"Sm" Date:10/5/2022

BaseLine:Line

Chi^2=9.22849E-04 Adj. R-Square=9.98851E-01 # of Data Points=92

SS=7.93651E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-51.37673	28.47572	-1.69496	1617.93953	-37.88685
2	Gaussian	-84.22898	38.25338	-2.06852	1647.49621	-62.11315

Figure S122. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

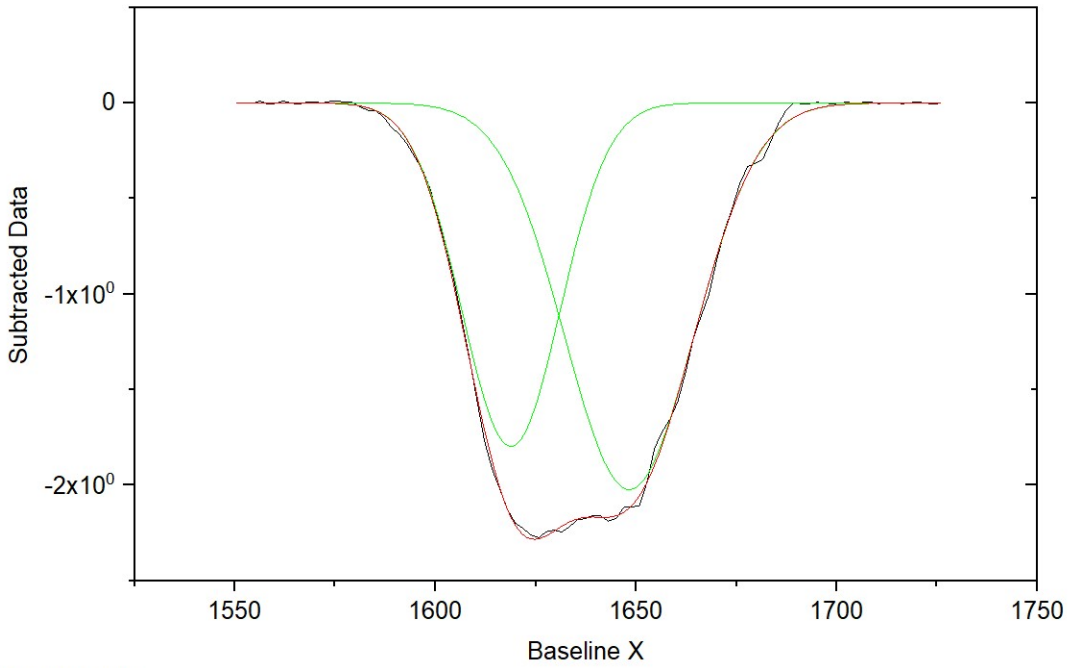
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!I"Eu" Date:10/5/2022

BaseLine:Line

Chi^2=7.52769E-04 Adj. R-Square=9.99076E-01 # of Data Points=92

SS=6.47381E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-54.9441	28.72573	-1.79687	1618.83948	-40.35212
2	Gaussian	-81.21752	37.71516	-2.02303	1648.30663	-59.64788

Figure S123. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

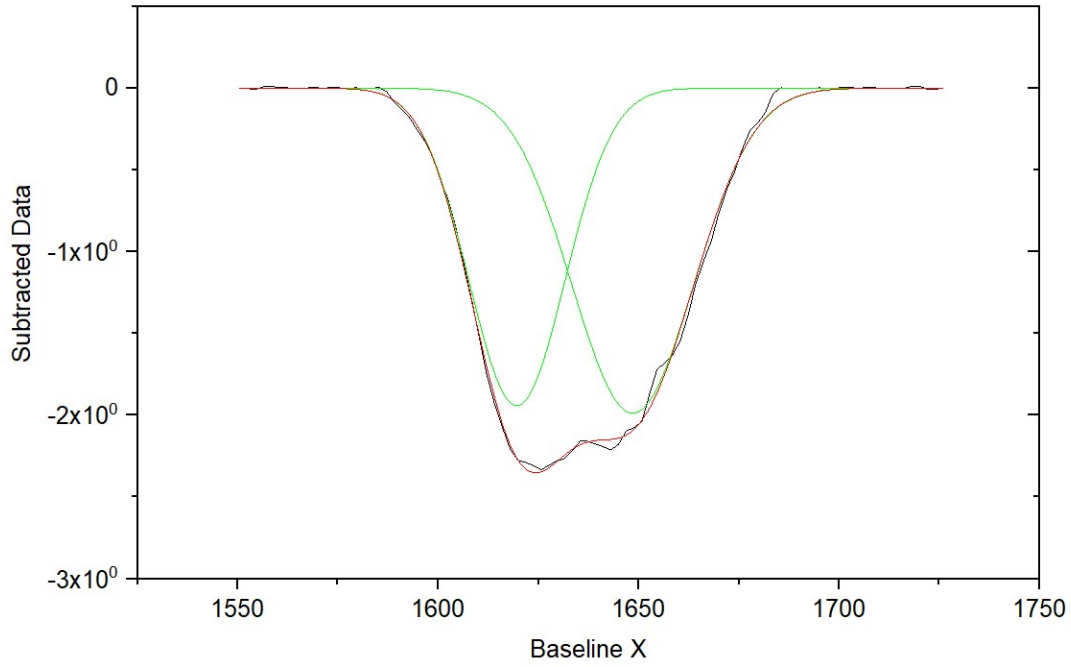
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!J"Gd" Date:10/5/2022

BaseLine:Line

Chi^2=1.35939E-03 Adj. R-Square=9.98369E-01 # of Data Points=92

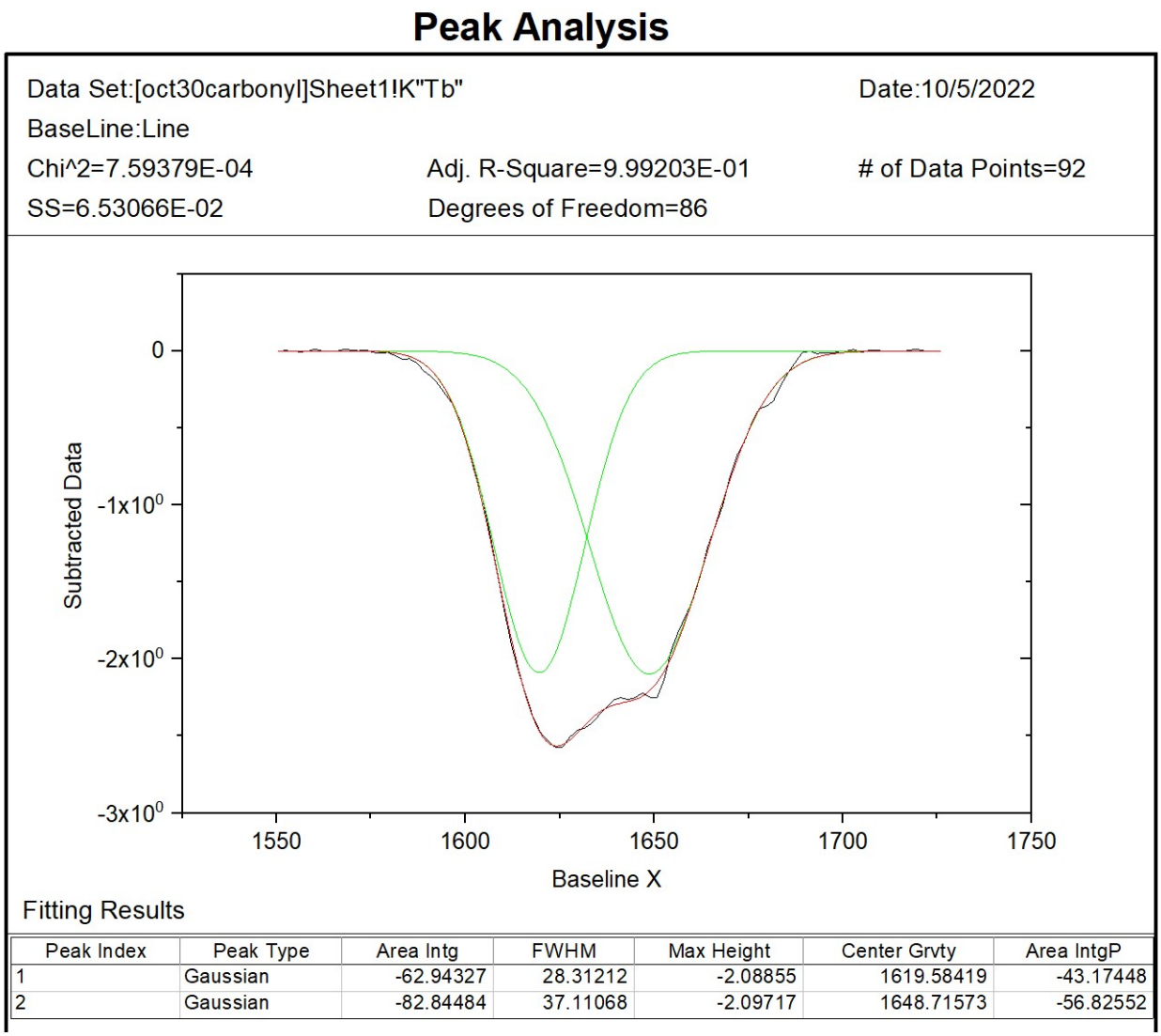
SS=1.16908E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-58.29064	28.21015	-1.94116	1619.64194	-43.56686
2	Gaussian	-75.50517	35.69079	-1.98741	1648.55236	-56.43314

Figure S124. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-62.94327	28.31212	-2.08855	1619.58419	-43.17448
2	Gaussian	-82.84484	37.11068	-2.09717	1648.71573	-56.82552

Figure S125. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

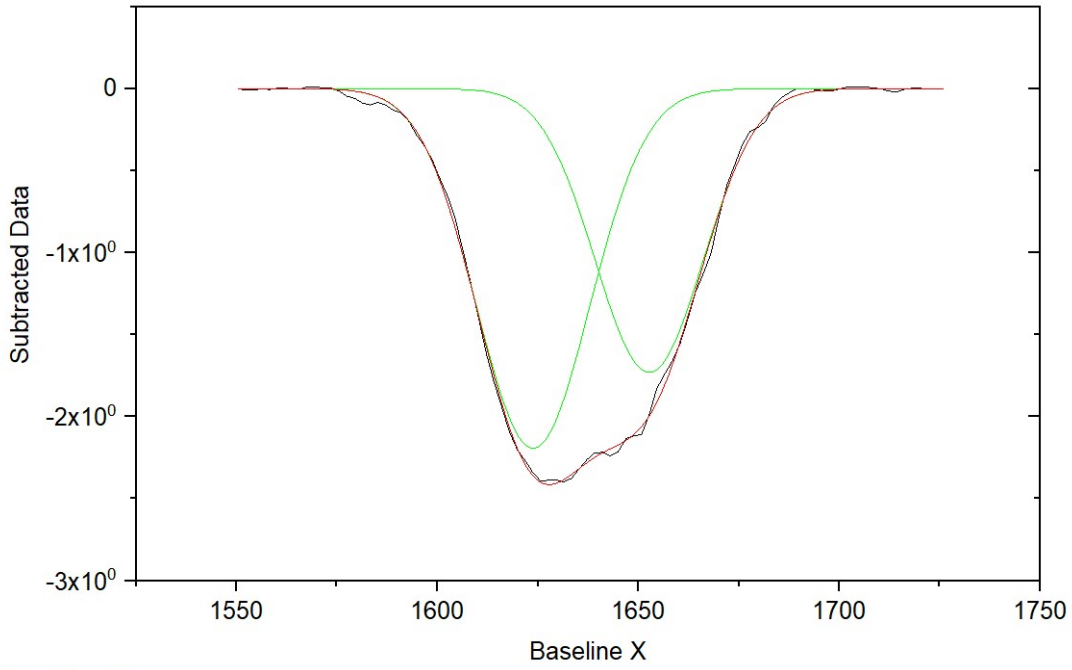
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!L"Dy" Date:10/5/2022

BaseLine:Line

Chi^2=8.60282E-04 Adj. R-Square=9.98983E-01 # of Data Points=92

SS=7.39842E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-77.30752	33.12467	-2.19249	1623.83215	-57.101
2	Gaussian	-58.07981	31.54775	-1.72952	1652.7157	-42.899

Figure S126. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.

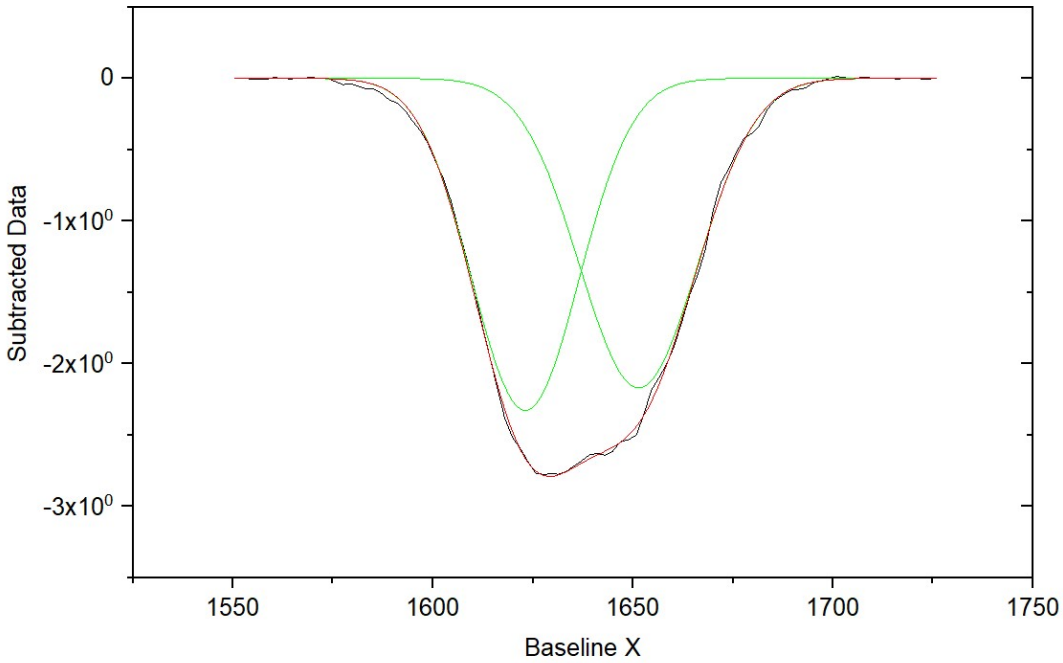
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!M"Ho" Date:10/5/2022

BaseLine:Line

Chi^2=8.75112E-04 Adj. R-Square=9.99232E-01 # of Data Points=92

SS=7.52596E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-78.13615	31.54493	-2.32697	1623.12874	-49.4454
2	Gaussian	-79.88898	34.60222	-2.16896	1651.426	-50.5546

Figure S127. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.

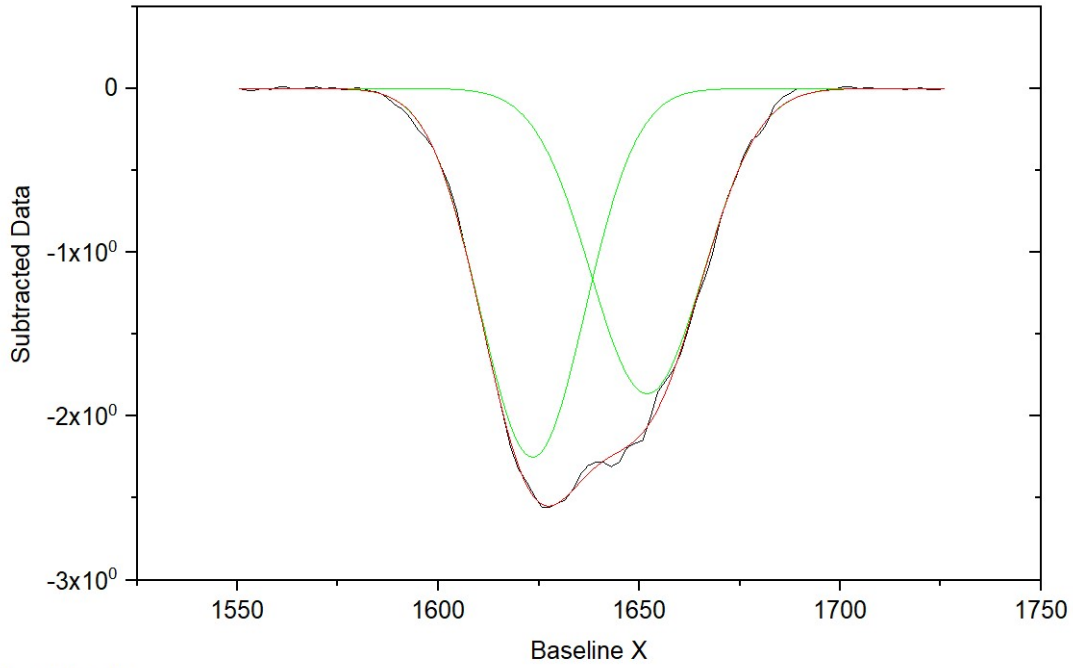
Peak Analysis

Data Set:[oct30carbonyl]Sheet1!N"Er" Date:10/5/2022

BaseLine:Line

Chi^2=7.62309E-04 Adj. R-Square=9.99166E-01 # of Data Points=92

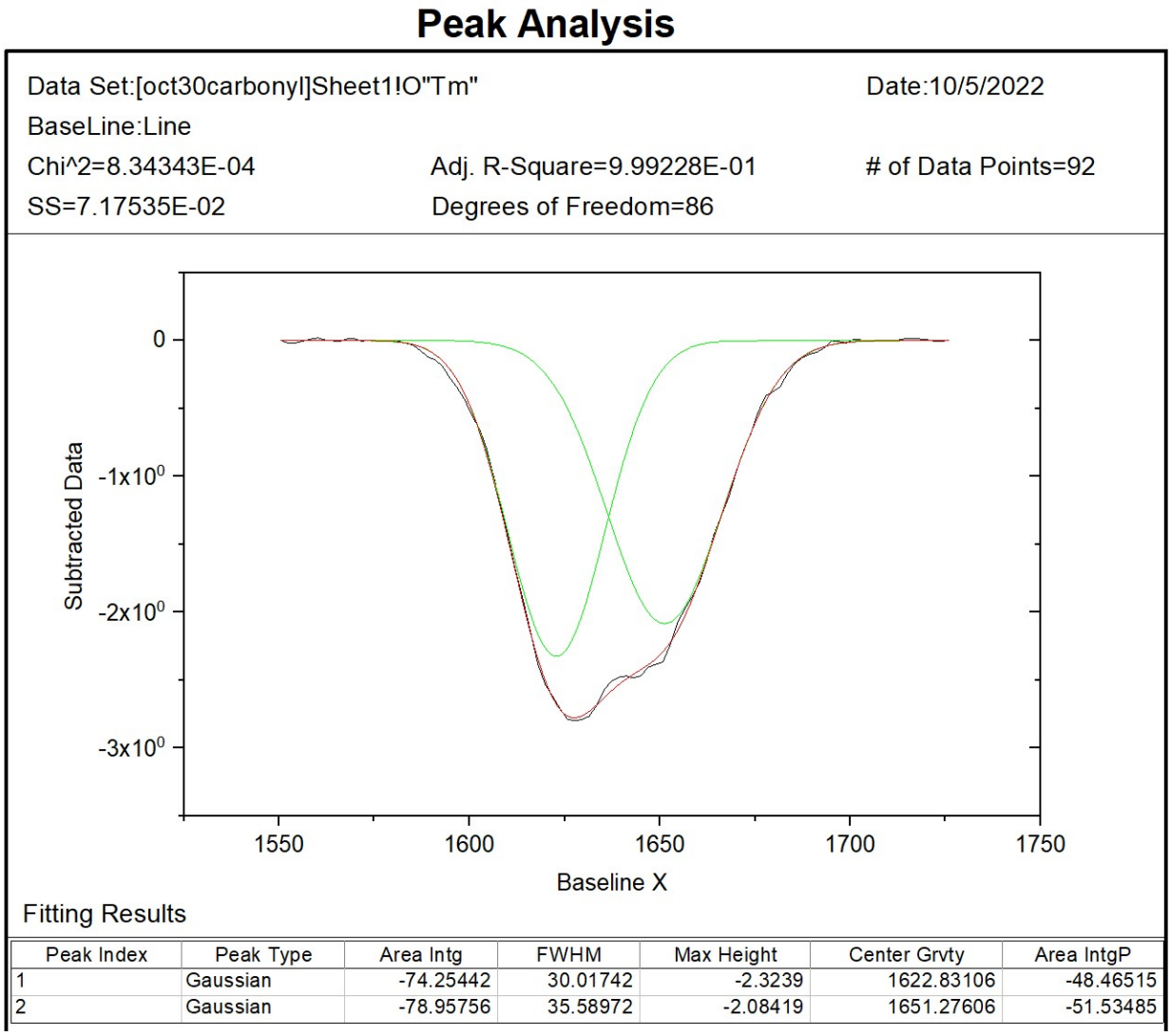
SS=6.55586E-02 Degrees of Freedom=86



Fitting Results

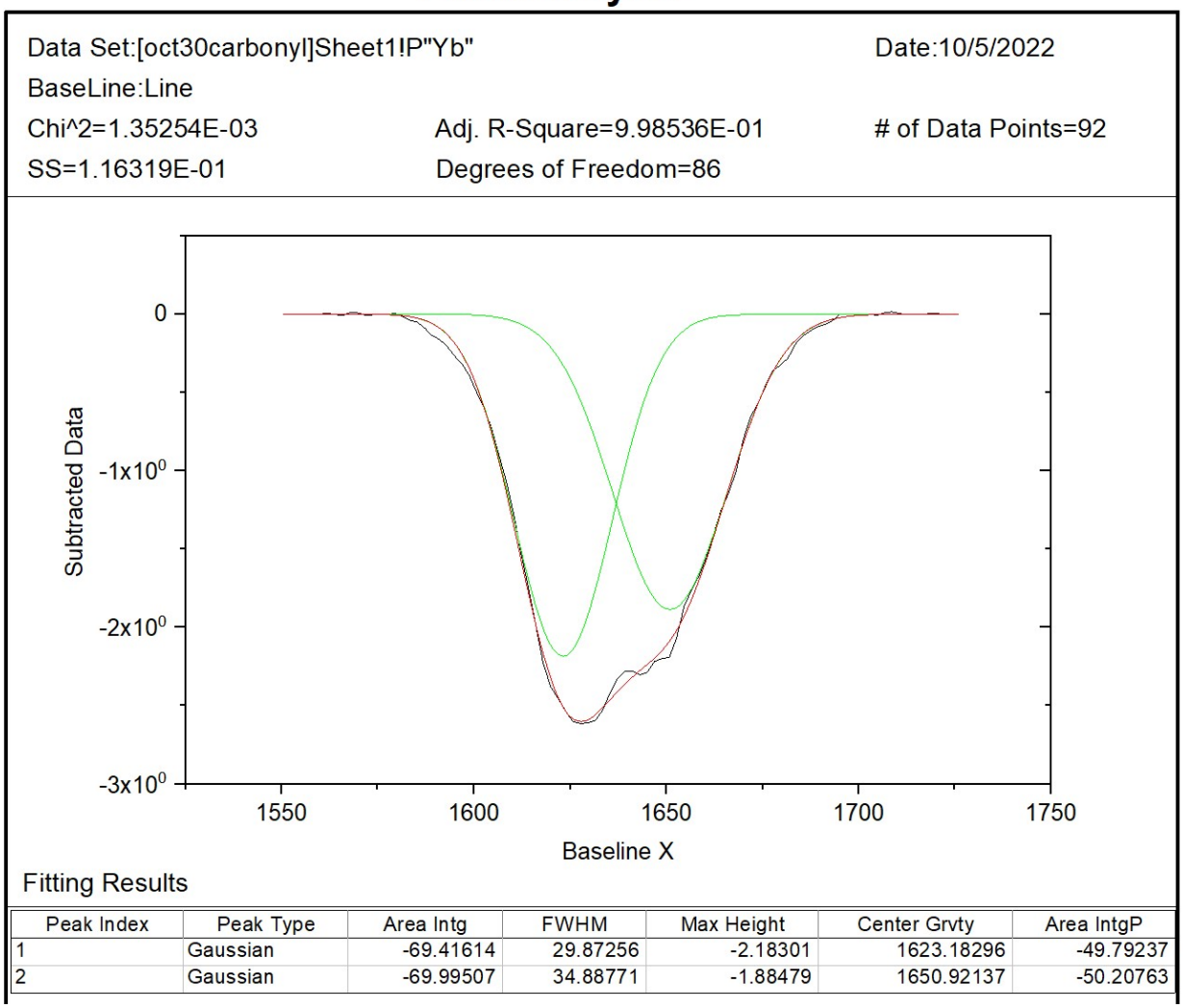
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-73.15261	30.55401	-2.24921	1623.46727	-52.84417
2	Gaussian	-65.2782	32.92161	-1.86275	1651.93118	-47.15583

Figure S128. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.



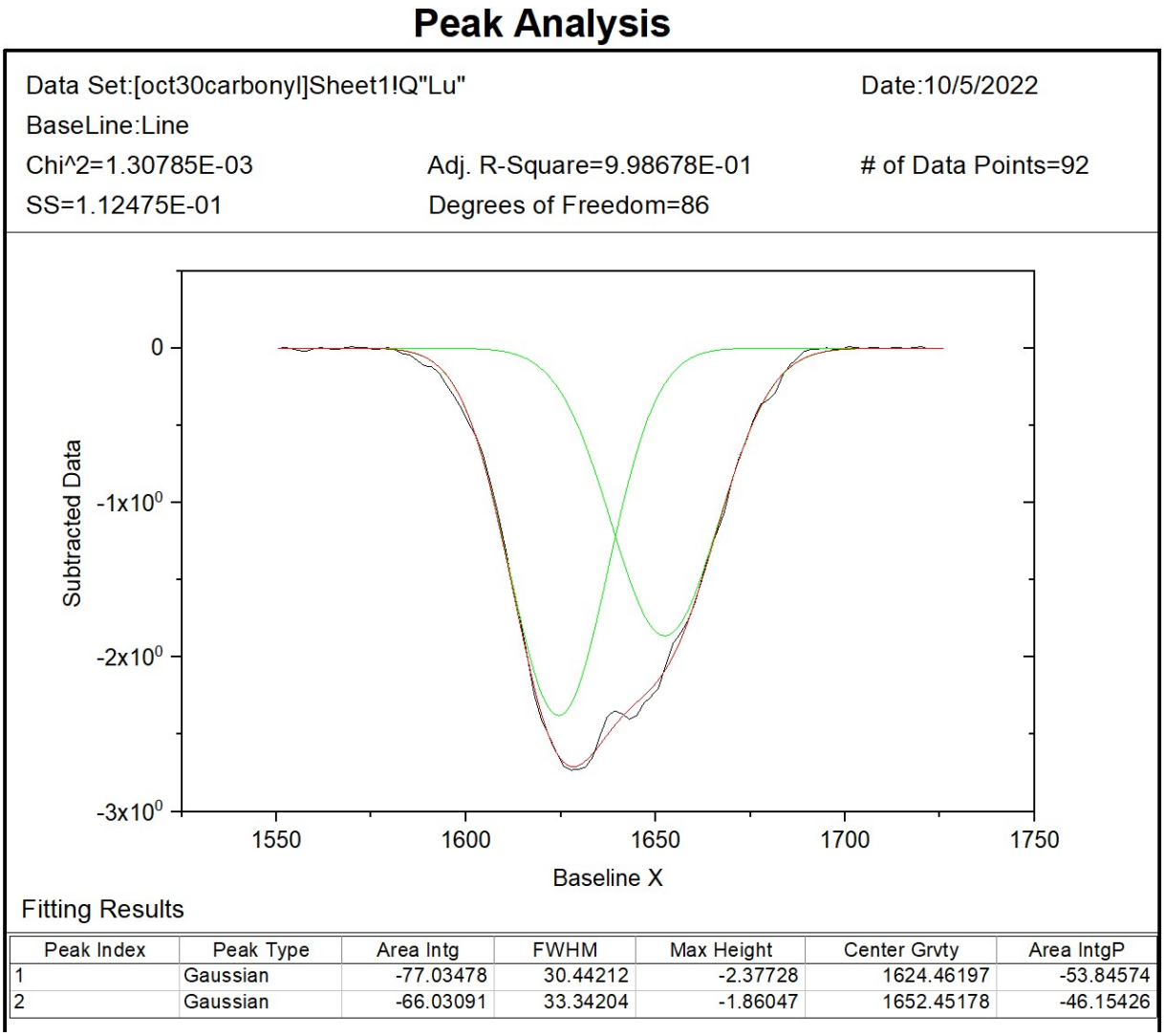
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-74.25442	30.01742	-2.3239	1622.83106	-48.46515
2	Gaussian	-78.95756	35.58972	-2.08419	1651.27606	-51.53485

Figure S129. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-69.41614	29.87256	-2.18301	1623.18296	-49.79237
2	Gaussian	-69.99507	34.88771	-1.88479	1650.92137	-50.20763

Figure S130. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.

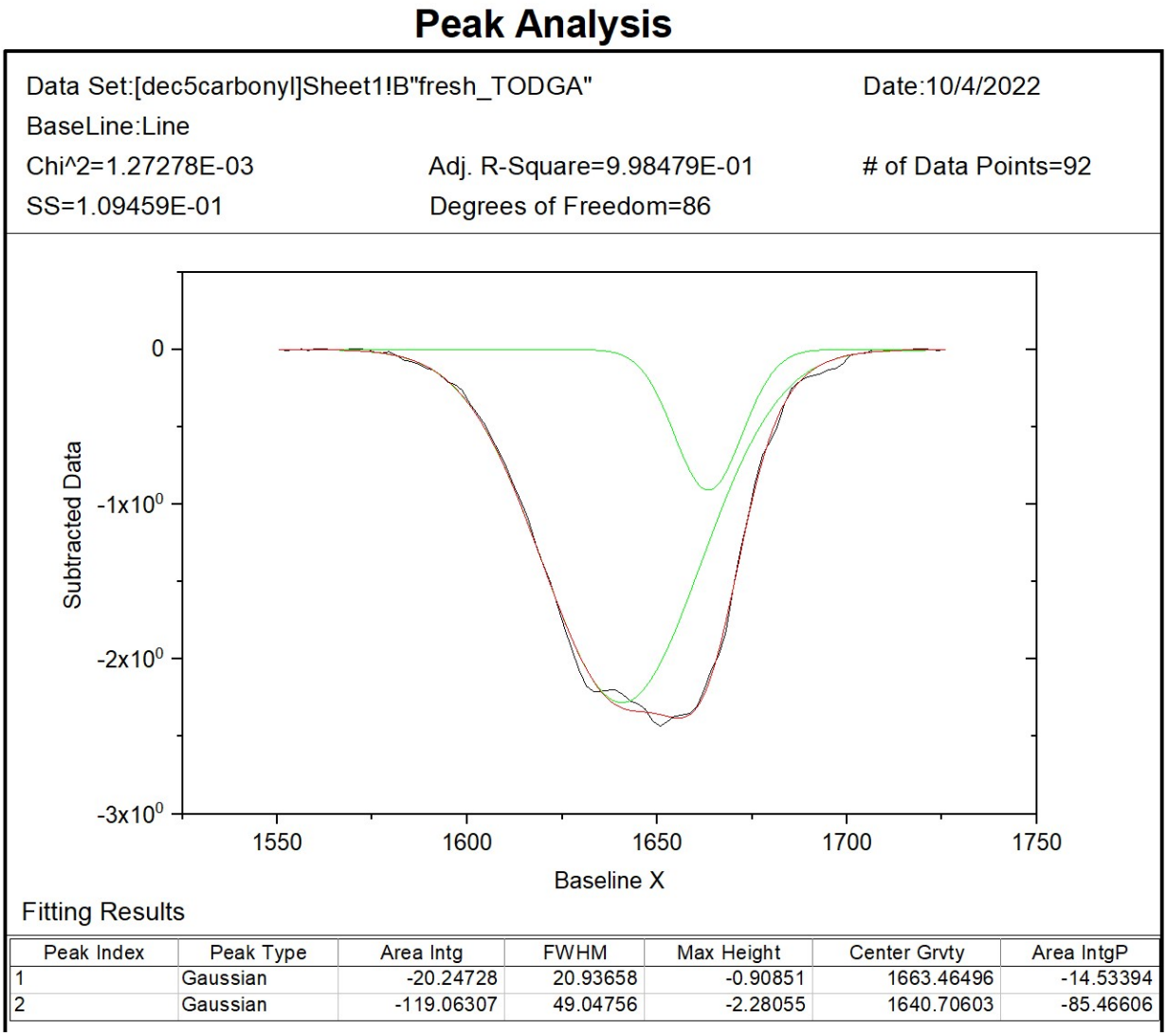


Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-77.03478	30.44212	-2.37728	1624.46197	-53.84574
2	Gaussian	-66.03091	33.34204	-1.86047	1652.45178	-46.15426

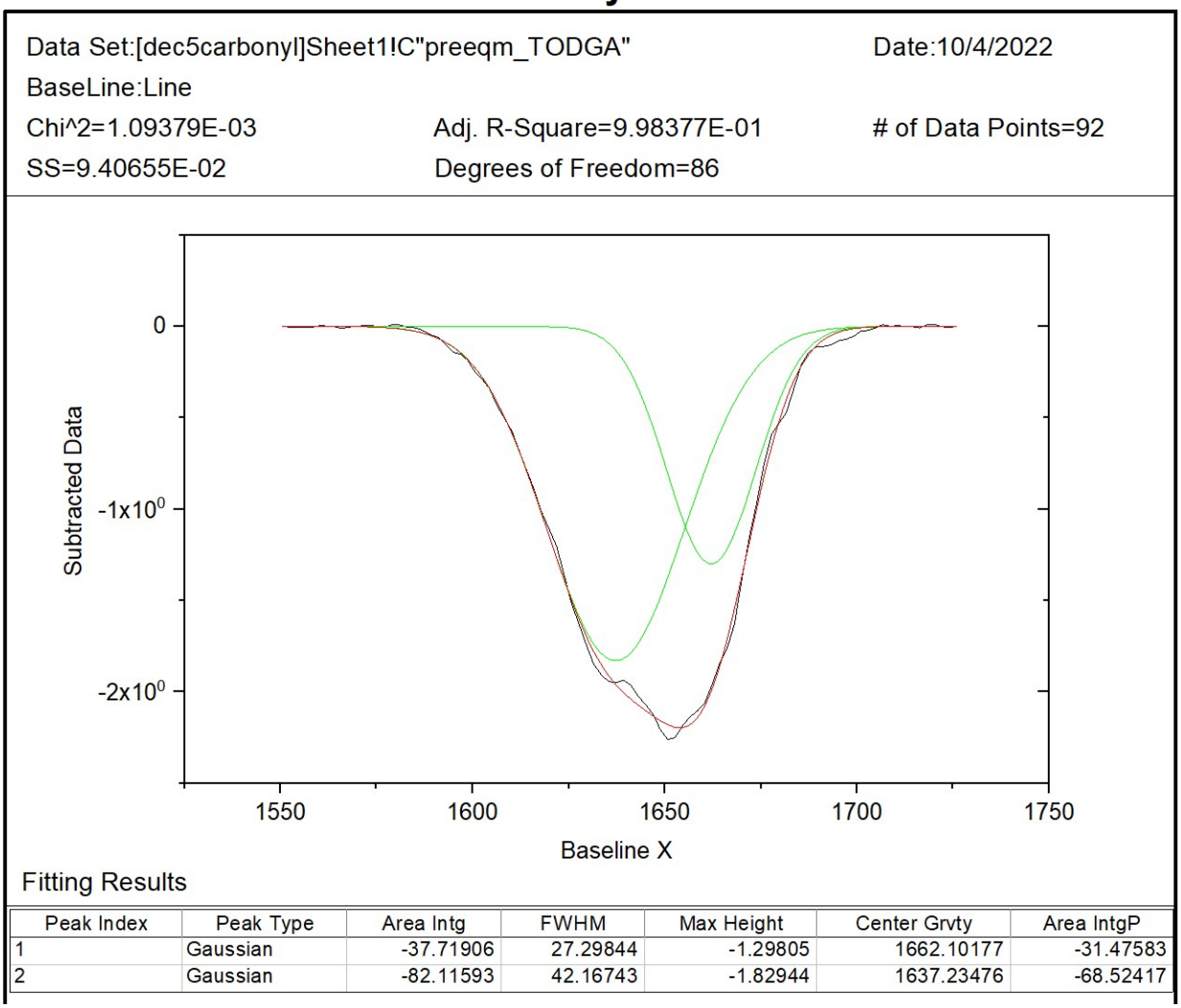
Figure S131. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-octanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

5 vol% 1-decanol



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-20.24728	20.93658	-0.90851	1663.46496	-14.53394
2	Gaussian	-119.06307	49.04756	-2.28055	1640.70603	-85.46606

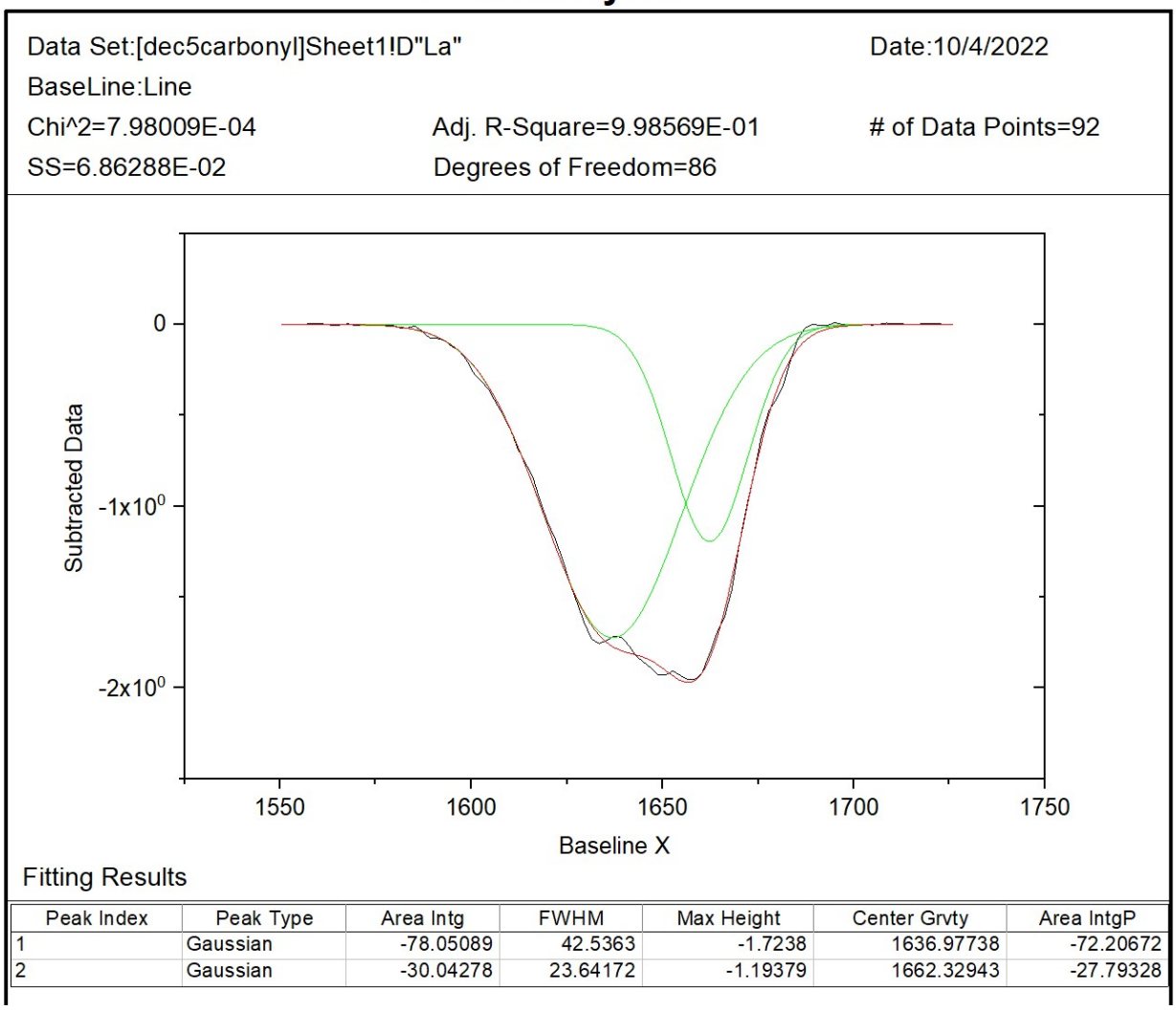
Figure S132. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 5 vol% 1-decanol in n-dodecane.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-37.71906	27.29844	-1.29805	1662.10177	-31.47583
2	Gaussian	-82.11593	42.16743	-1.82944	1637.23476	-68.52417

Figure S133. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-78.05089	42.5363	-1.7238	1636.97738	-72.20672
2	Gaussian	-30.04278	23.64172	-1.19379	1662.32943	-27.79328

Figure S134. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

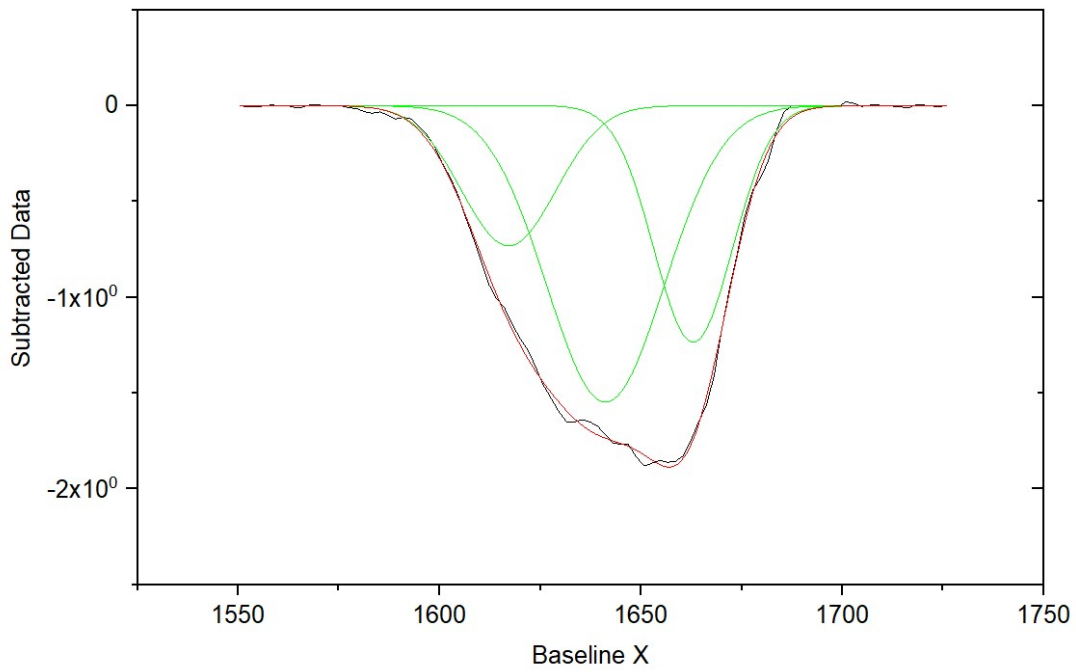
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!E"Ce" Date:10/4/2022

BaseLine:Line

Chi^2=7.08972E-04 Adj. R-Square=9.98657E-01 # of Data Points=92

SS=5.88446E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-56.62989	34.39306	-1.54683	1641.19315	-52.35982
2	Gaussian	-30.1031	22.91606	-1.23407	1662.96133	-27.83323
3	Gaussian	-21.42226	27.52532	-0.73114	1617.16095	-19.80695

Figure S135. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

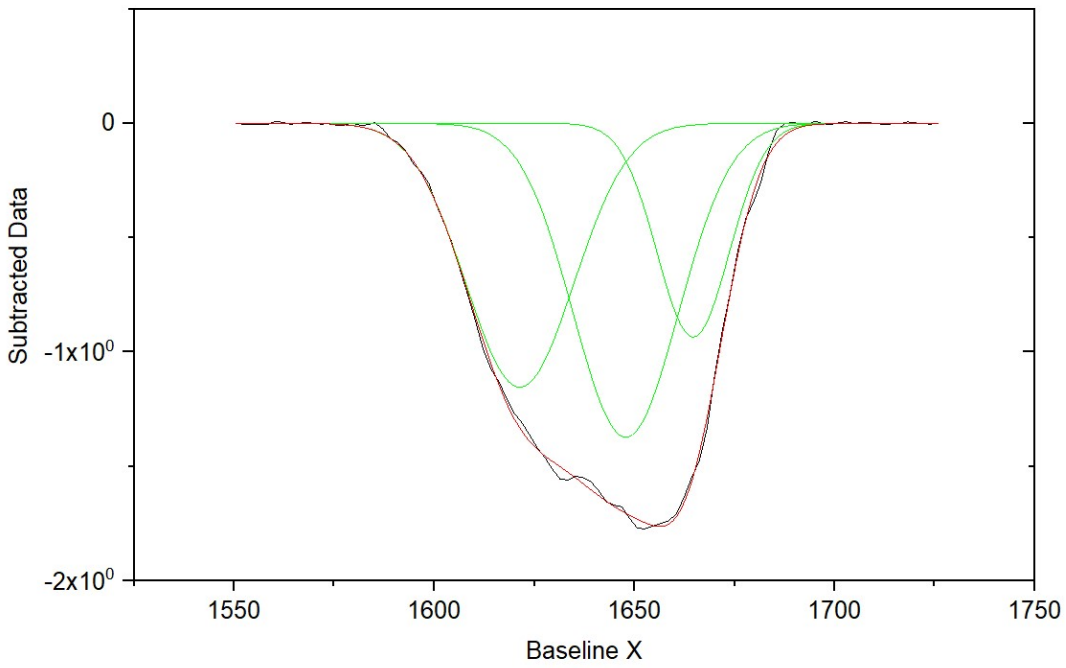
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!F"Pr" Date:10/4/2022

BaseLine:Line

Chi^2=4.47805E-04 Adj. R-Square=9.99064E-01 # of Data Points=92

SS=3.71678E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-45.14753	30.88597	-1.37322	1647.87221	-42.86597
2	Gaussian	-21.09979	21.21673	-0.93426	1664.67956	-20.03349
3	Gaussian	-39.07524	31.80157	-1.15431	1621.38121	-37.10054

Figure S136. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

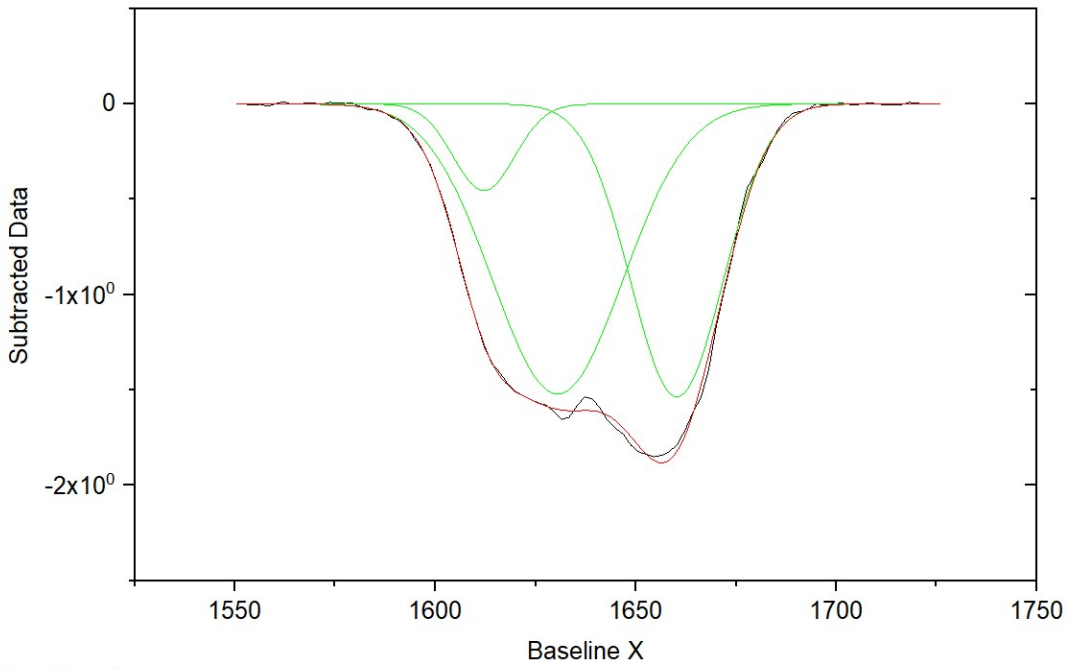
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!G"Nd" Date:10/4/2022

BaseLine:Line

Chi^2=5.56368E-04 Adj. R-Square=9.98961E-01 # of Data Points=92

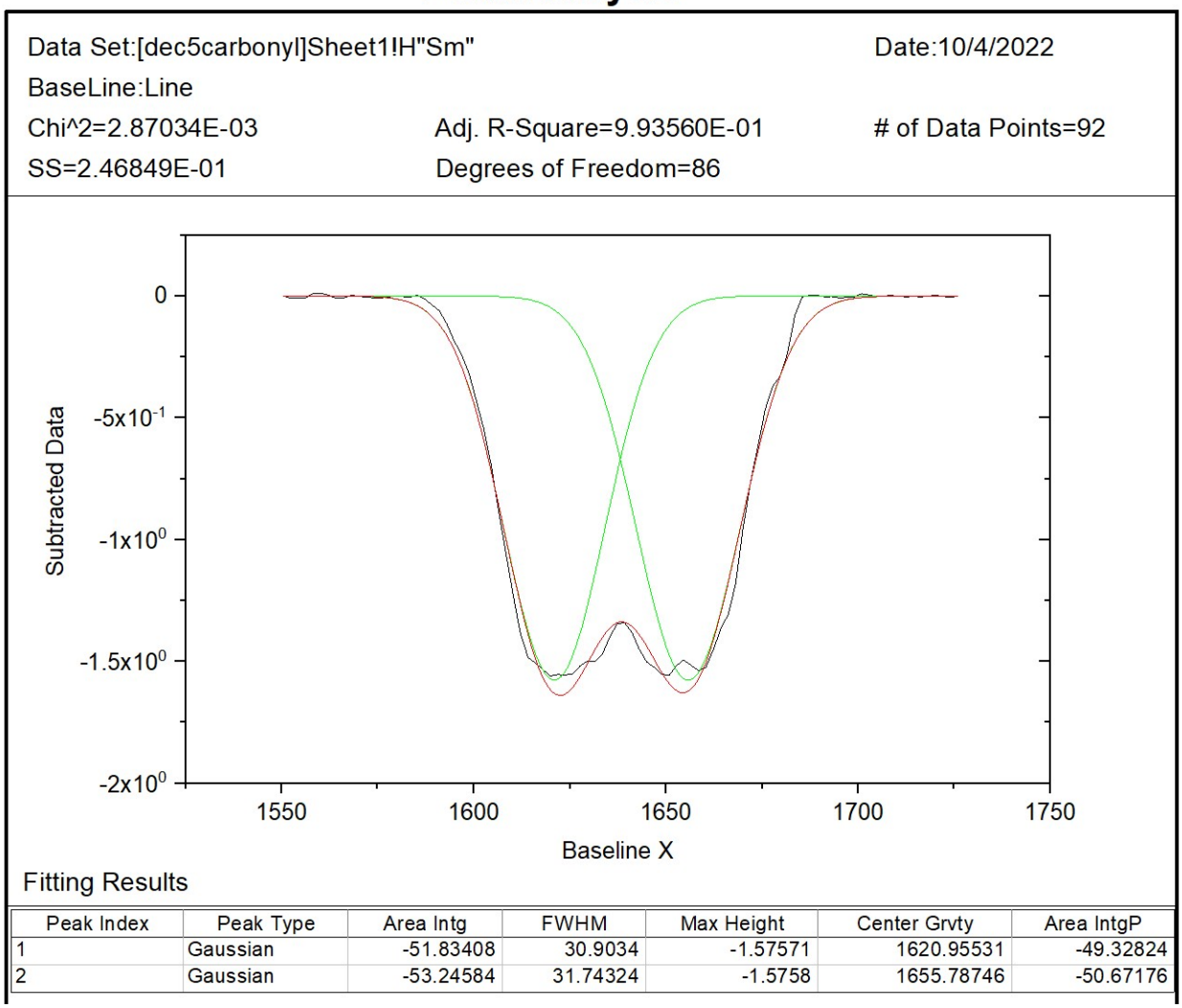
SS=4.61786E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-62.08659	38.33482	-1.5215	1630.51142	-53.91043
2	Gaussian	-44.33011	27.11835	-1.53569	1660.25299	-38.49229
3	Gaussian	-8.74949	18.08996	-0.45437	1612.12268	-7.59728

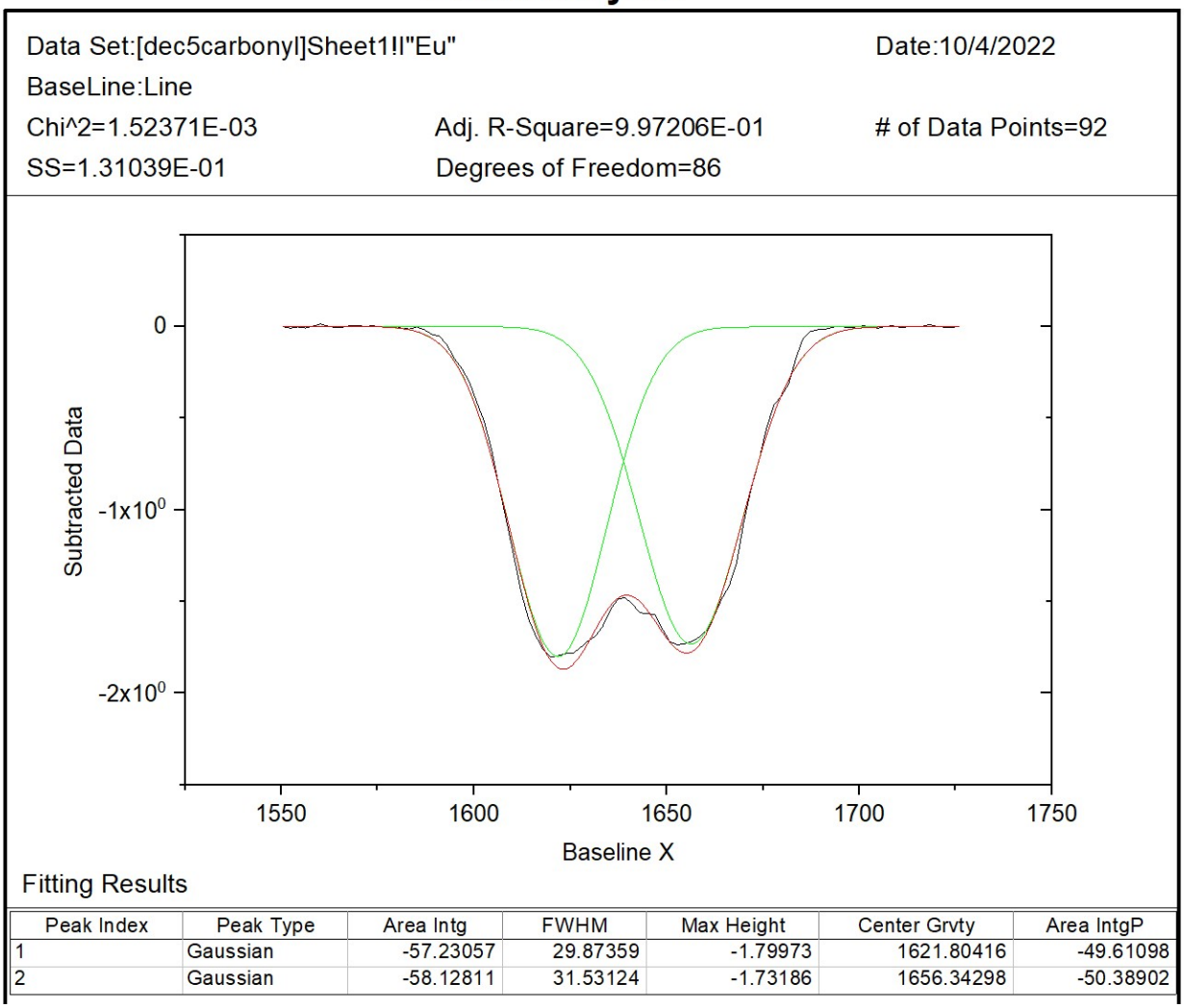
Figure S137. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-51.83408	30.9034	-1.57571	1620.95531	-49.32824
2	Gaussian	-53.24584	31.74324	-1.5758	1655.78746	-50.67176

Figure S138. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-57.23057	29.87359	-1.79973	1621.80416	-49.61098
2	Gaussian	-58.12811	31.53124	-1.73186	1656.34298	-50.38902

Figure S139. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.

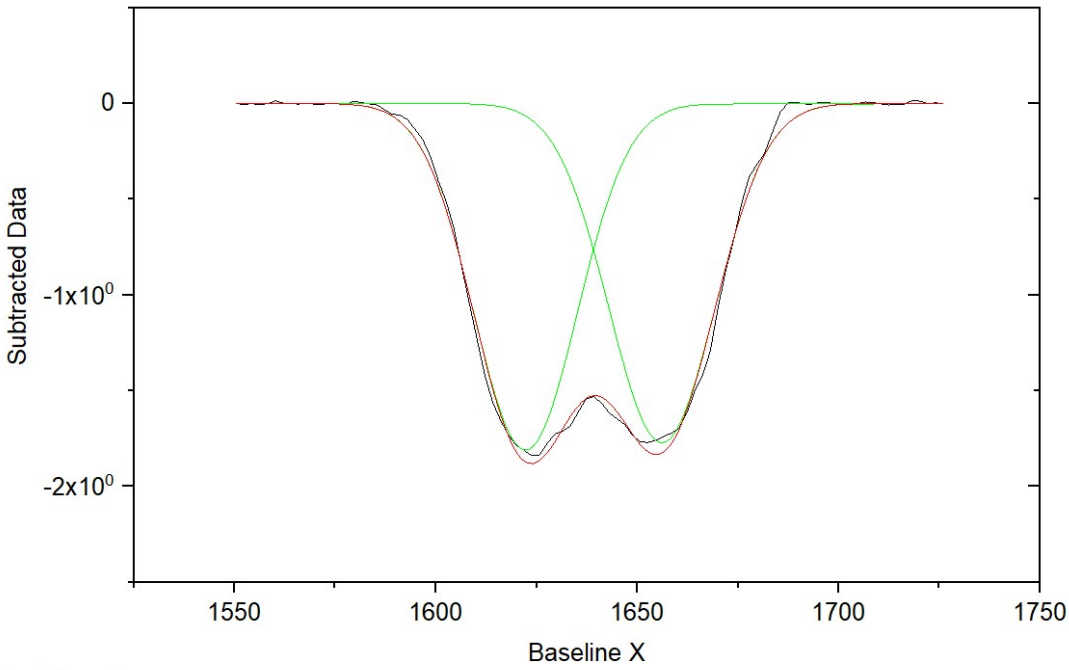
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!J"Gd" Date:10/4/2022

BaseLine:Line

Chi^2=1.72464E-03 Adj. R-Square=9.96969E-01 # of Data Points=92

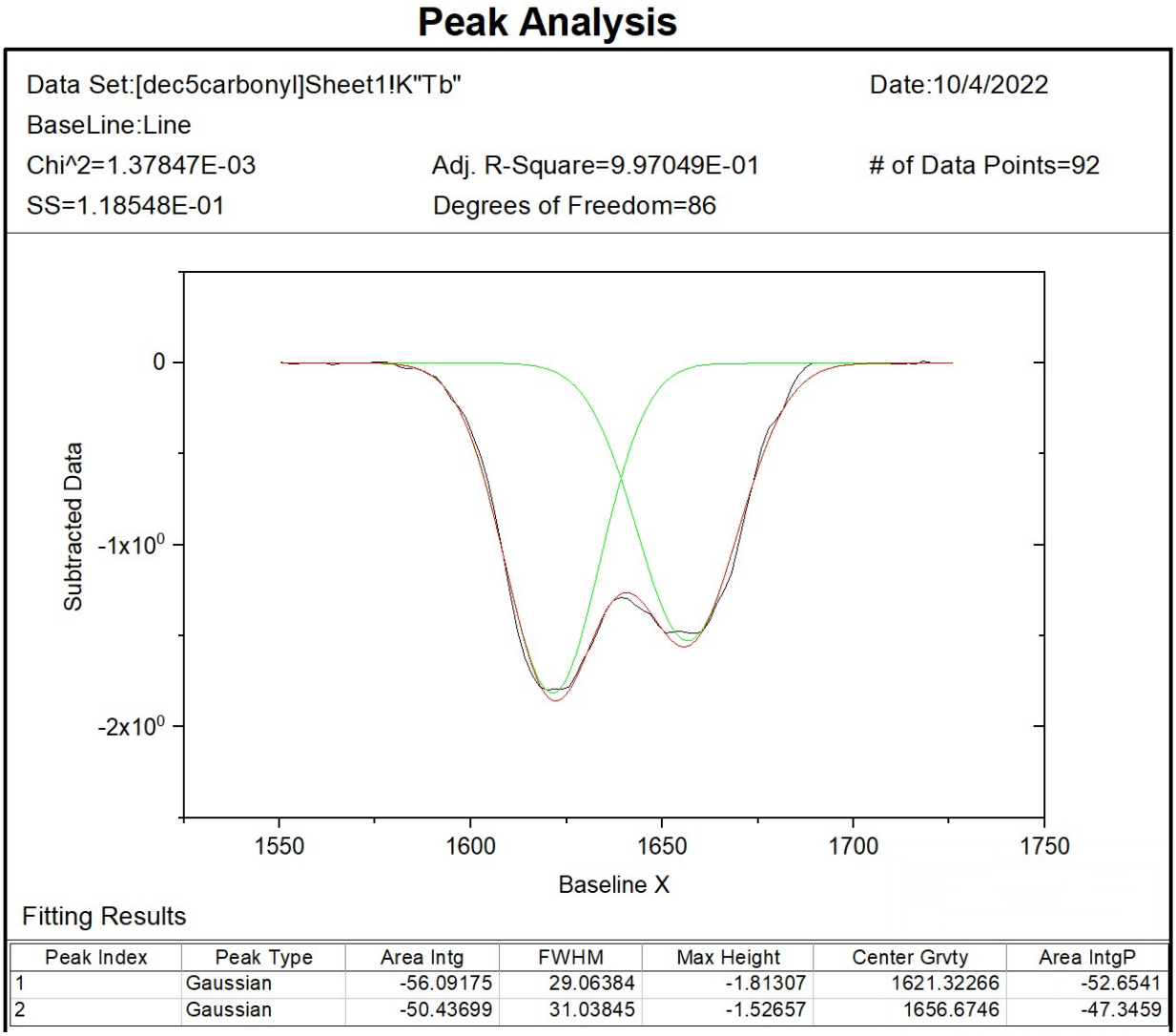
SS=1.48319E-01 Degrees of Freedom=86



Fitting Results

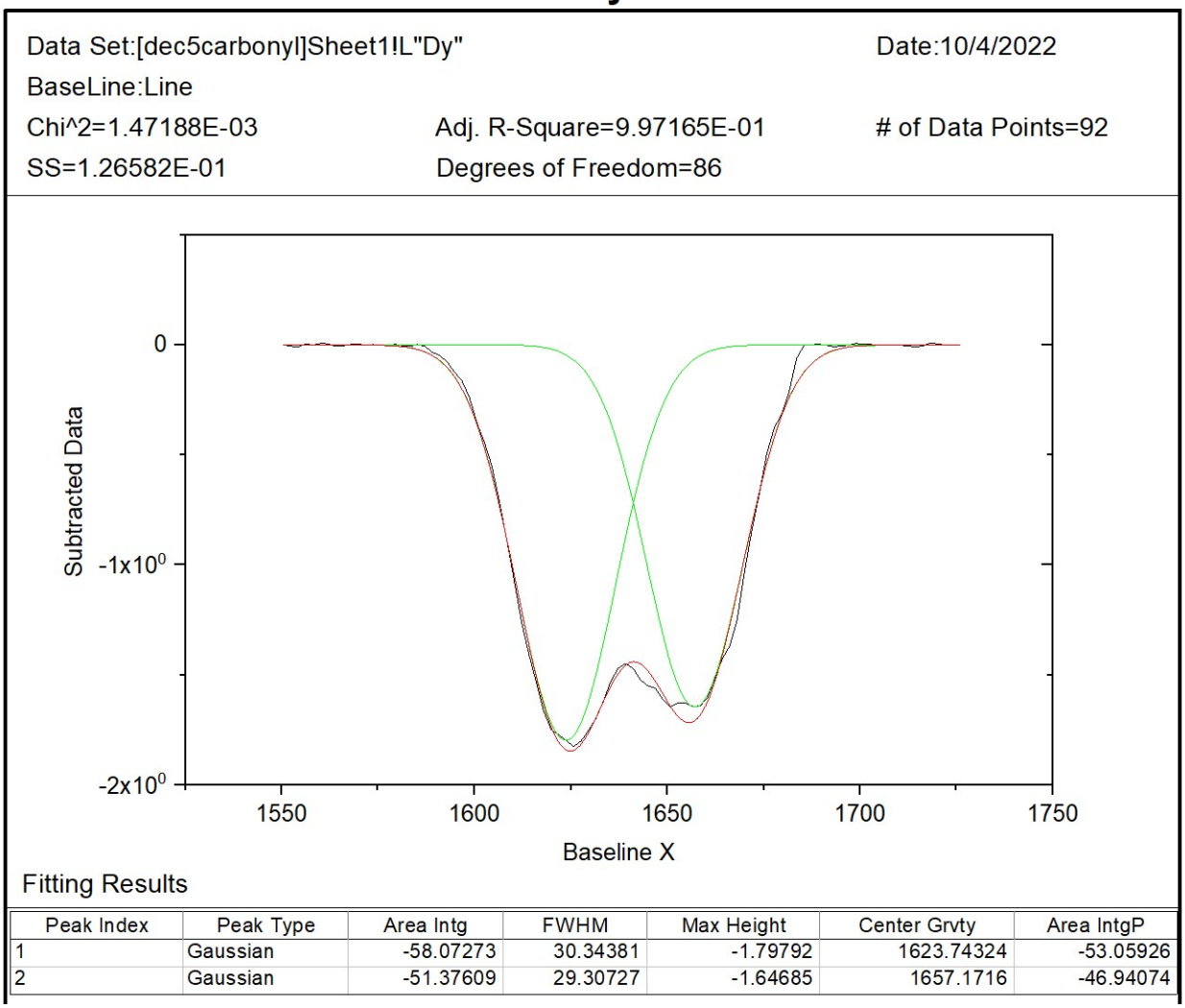
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-58.13873	30.18599	-1.80937	1622.2669	-49.9637
2	Gaussian	-58.2232	30.88723	-1.77086	1656.13752	-50.0363

Figure S140. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.



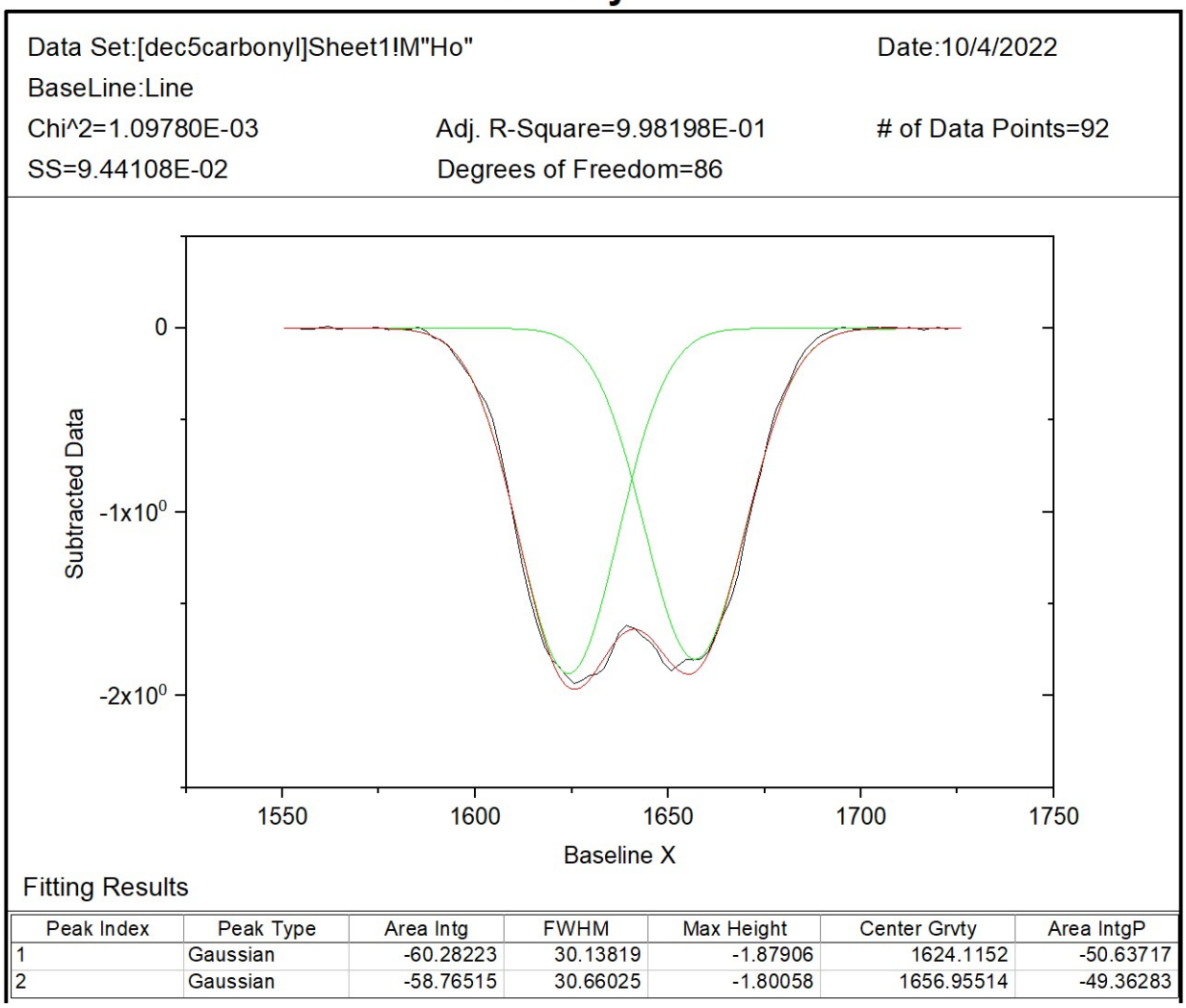
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-56.09175	29.06384	-1.81307	1621.32266	-52.6541
2	Gaussian	-50.43699	31.03845	-1.52657	1656.6746	-47.3459

Figure S141. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-58.07273	30.34381	-1.79792	1623.74324	-53.05926
2	Gaussian	-51.37609	29.30727	-1.64685	1657.1716	-46.94074

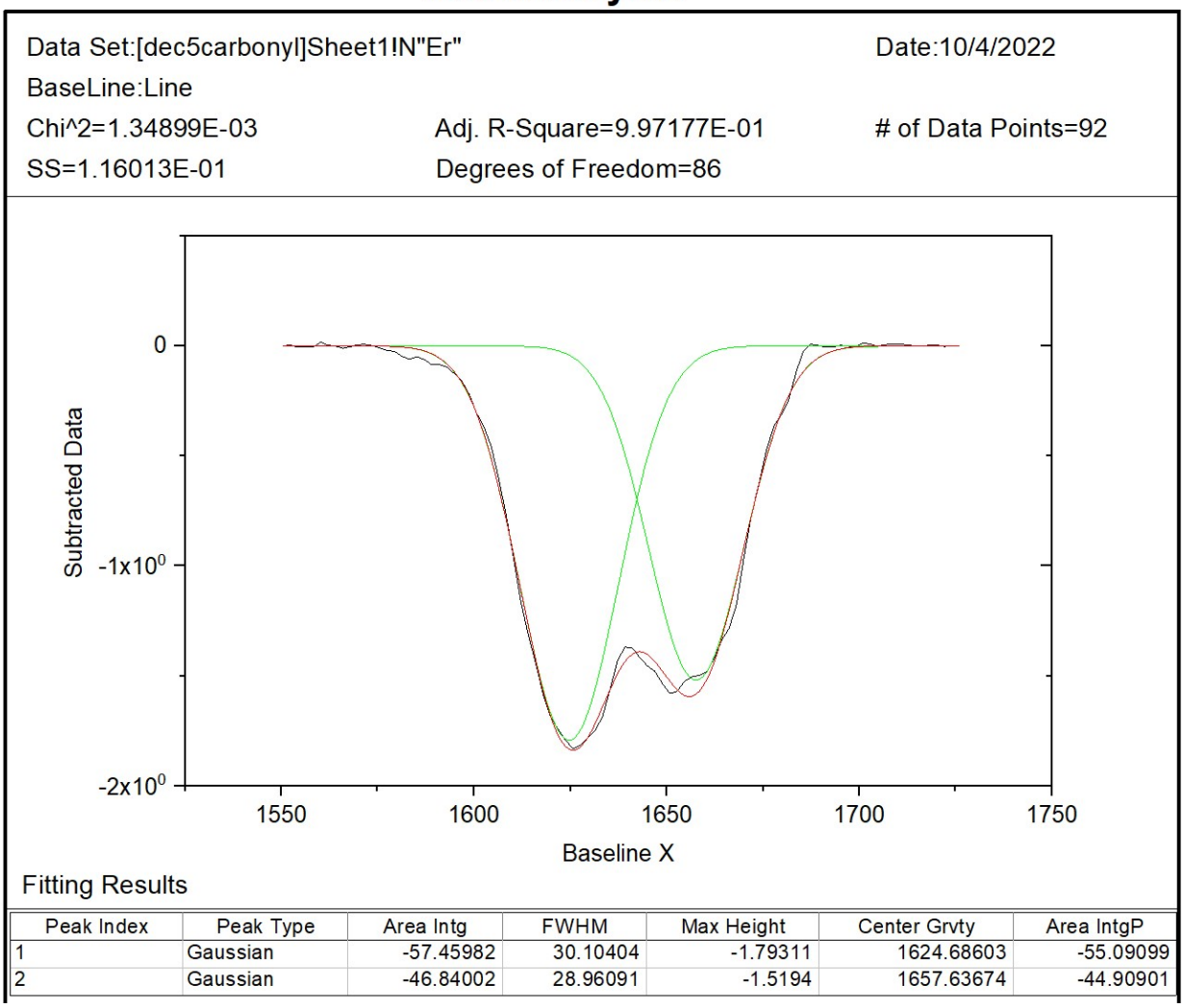
Figure S142. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-60.28223	30.13819	-1.87906	1624.1152	-50.63717
2	Gaussian	-58.76515	30.66025	-1.80058	1656.95514	-49.36283

Figure S143. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-57.45982	30.10404	-1.79311	1624.68603	-55.09099
2	Gaussian	-46.84002	28.96091	-1.5194	1657.63674	-44.90901

Figure S144. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.

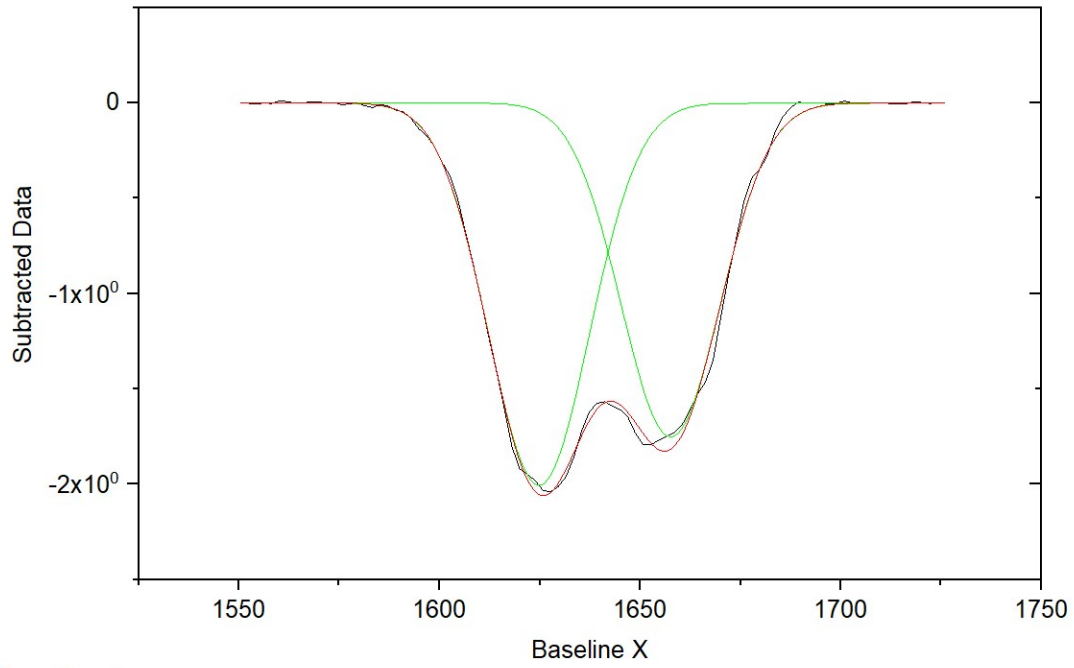
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!O"Tm" Date:10/4/2022

BaseLine:Line

Chi^2=1.21160E-03 Adj. R-Square=9.98013E-01 # of Data Points=92

SS=1.04198E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-63.00452	29.51513	-2.00537	1624.81668	-53.83334
2	Gaussian	-54.03173	28.97686	-1.75172	1657.63153	-46.16666

Figure S145. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.

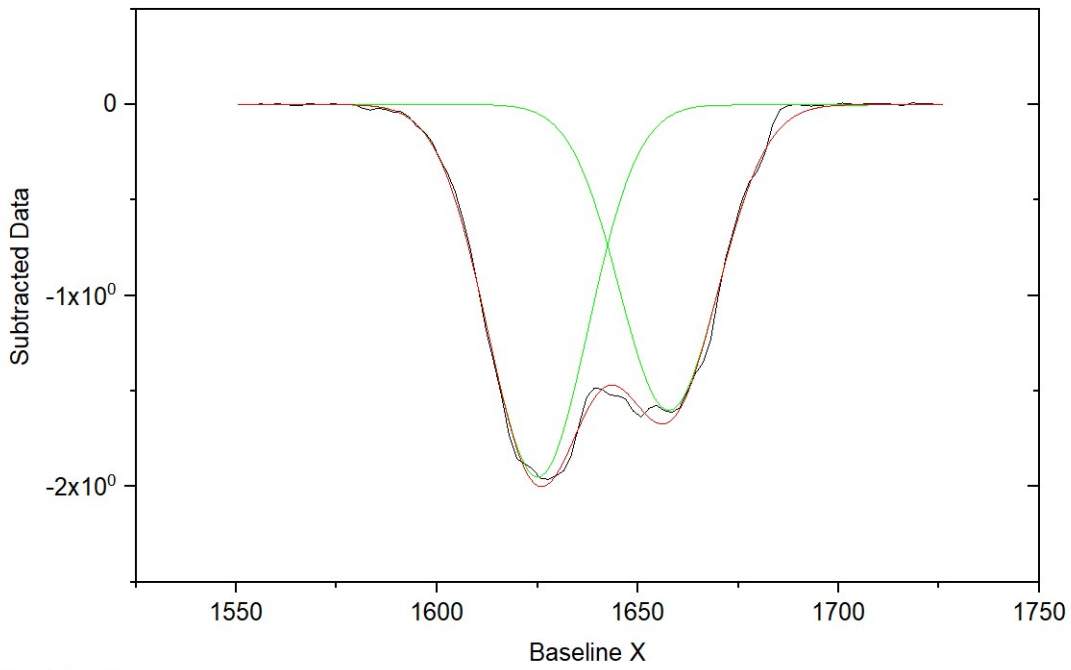
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!P"Yb" Date:10/4/2022

BaseLine:Line

Chi^2=1.33193E-03 Adj. R-Square=9.97572E-01 # of Data Points=92

SS=1.14546E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-60.87257	29.32084	-1.95035	1625.07011	-55.31893
2	Gaussian	-49.16674	28.86982	-1.59991	1657.71989	-44.68107

Figure S146. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.

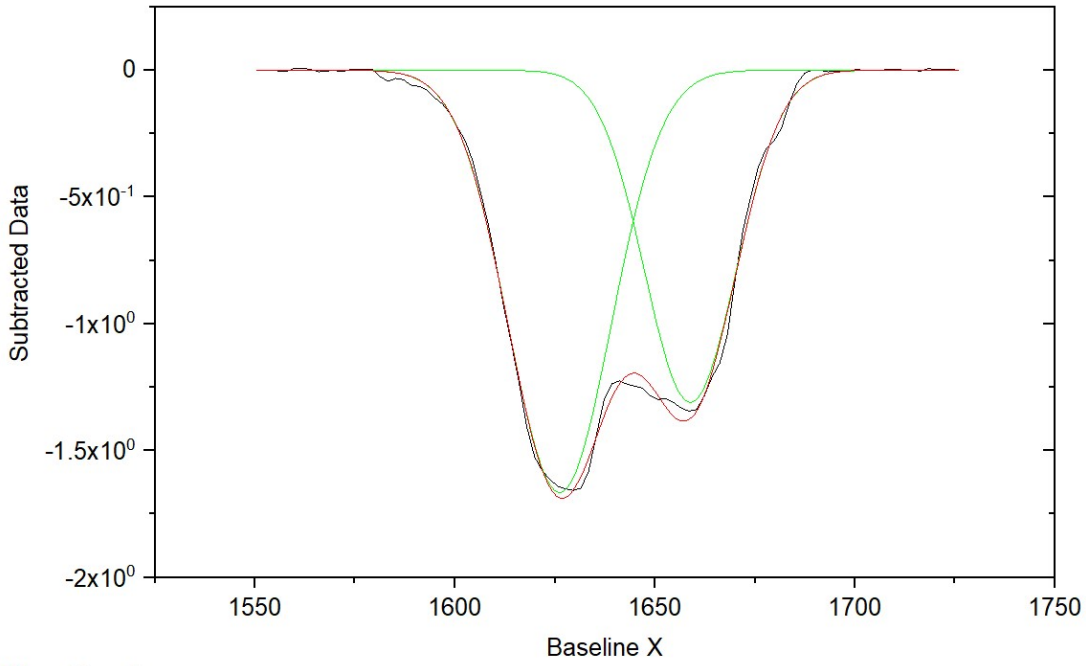
Peak Analysis

Data Set:[dec5carbonyl]Sheet1!Q"Lu" Date:10/4/2022

BaseLine:Line

Chi^2=9.03127E-04 Adj. R-Square=9.97615E-01 # of Data Points=92

SS=7.76689E-02 Degrees of Freedom=86

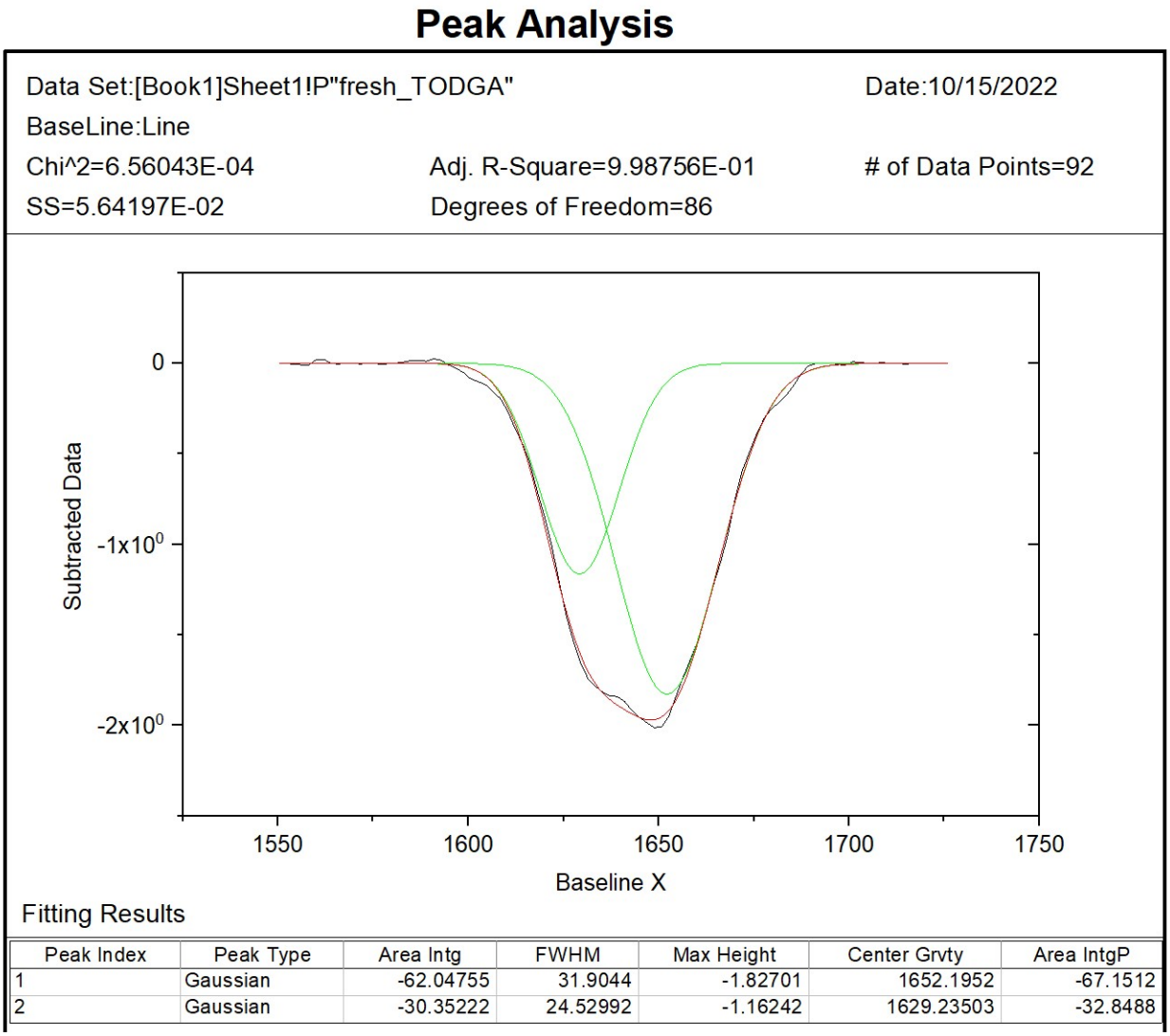


Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-53.5293	30.21363	-1.6644	1626.18221	-58.81054
2	Gaussian	-37.49061	26.90958	-1.30883	1658.86782	-41.18946

Figure S147. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-decanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

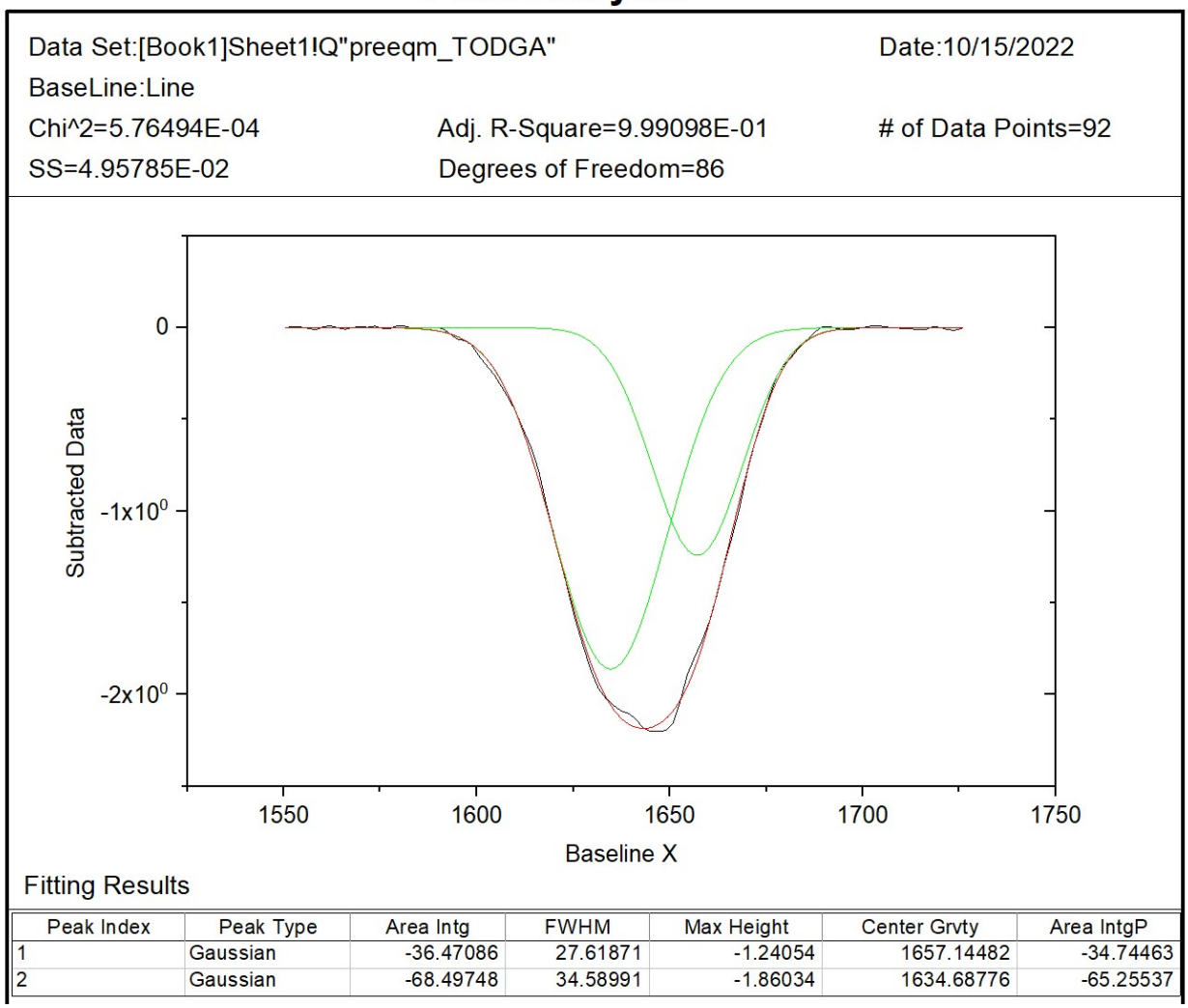
30 vol% 1-decanol



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-62.04755	31.9044	-1.82701	1652.1952	-67.1512
2	Gaussian	-30.35222	24.52992	-1.16242	1629.23503	-32.8488

Figure S148. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 30 vol% 1-decanol in n-dodecane.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-36.47086	27.61871	-1.24054	1657.14482	-34.74463
2	Gaussian	-68.49748	34.58991	-1.86034	1634.68776	-65.25537

Figure S149. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 1 M HNO_3.

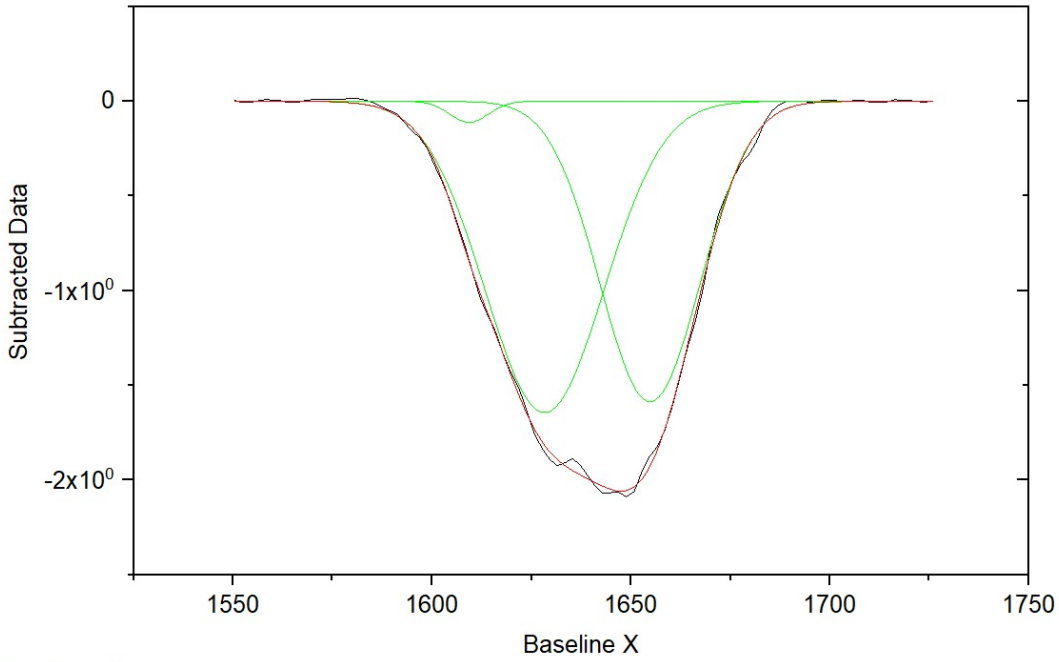
Peak Analysis

Data Set:[Book1]Sheet1!B"La" Date:10/15/2022

BaseLine:Line

Chi^2=5.37272E-04 Adj. R-Square=9.99133E-01 # of Data Points=92

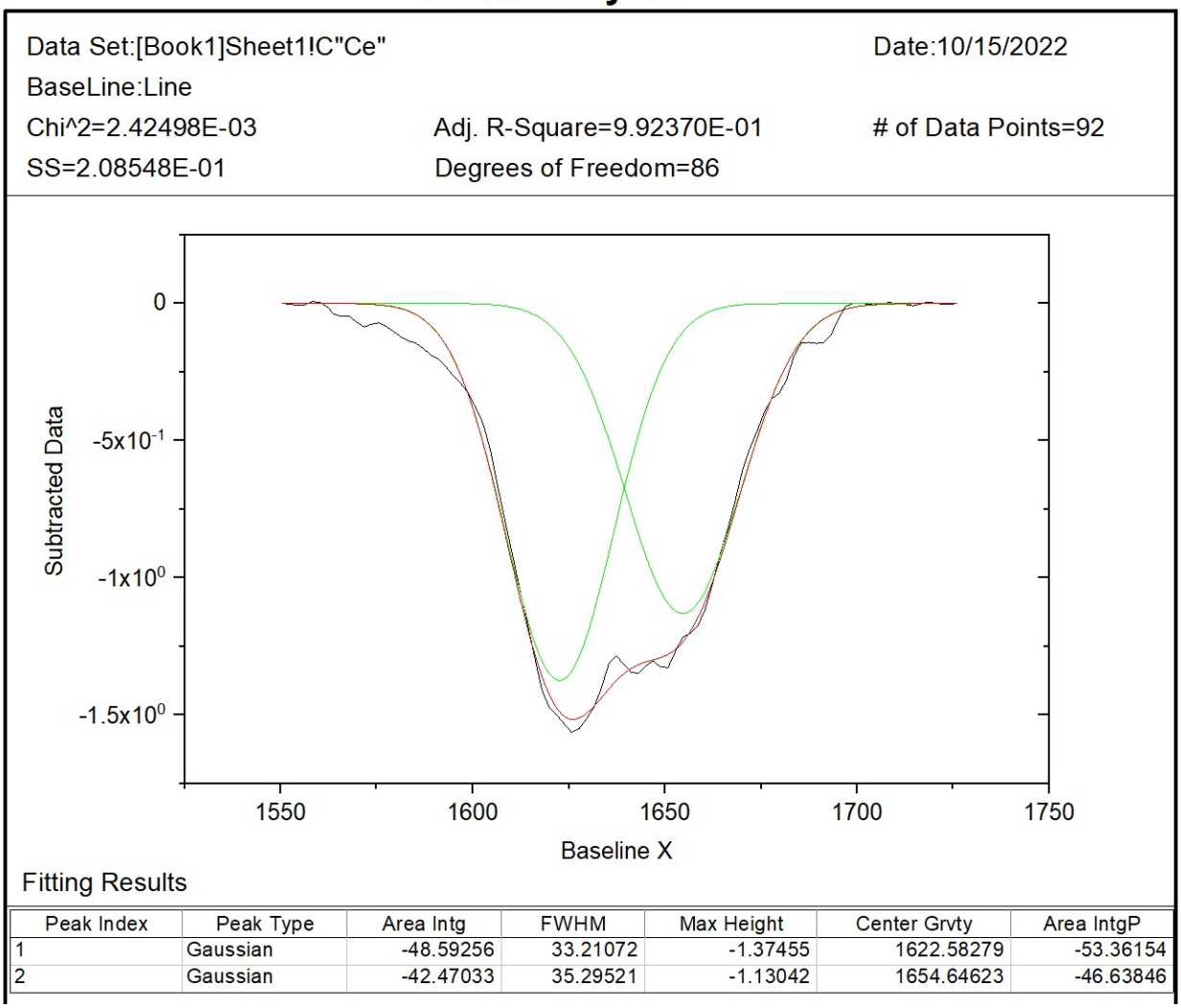
SS=4.45935E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-1.36359	11.53383	-0.11107	1609.3498	-1.20676
2	Gaussian	-61.55226	35.19127	-1.64315	1628.29779	-54.47328
3	Gaussian	-50.07948	29.6576	-1.58632	1654.8252	-44.31996

Figure S150. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-48.59256	33.21072	-1.37455	1622.58279	-53.36154
2	Gaussian	-42.47033	35.29521	-1.13042	1654.64623	-46.63846

Figure S151. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

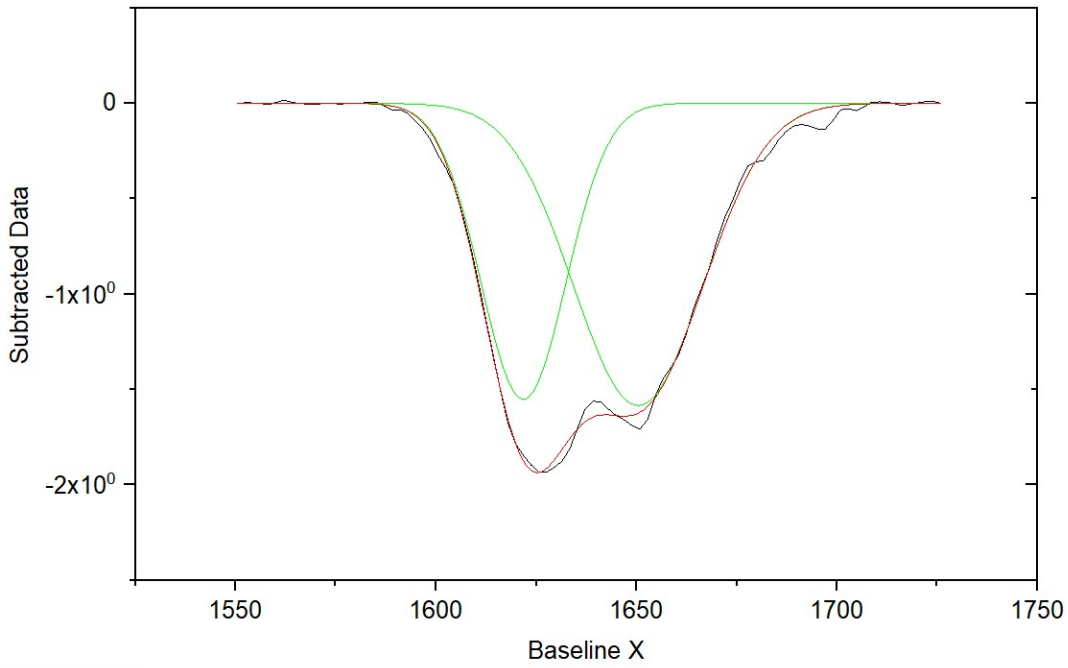
Peak Analysis

Data Set:[Book1]Sheet1!D"Pr" Date:10/15/2022

BaseLine:Line

Chi^2=1.32670E-03 Adj. R-Square=9.97394E-01 # of Data Points=92

SS=1.14096E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-41.22151	24.95836	-1.55159	1621.81963	-39.22195
2	Gaussian	-63.87656	37.87895	-1.58421	1650.46696	-60.77805

Figure S152. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

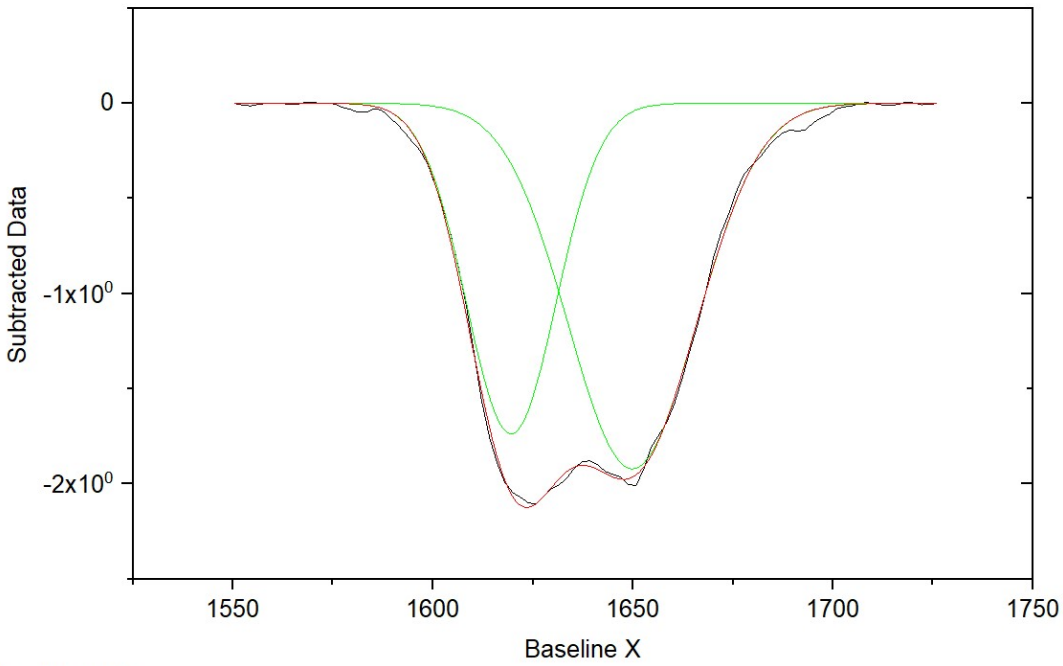
Peak Analysis

Data Set:[Book1]Sheet1!E"Nd" Date:10/15/2022

BaseLine:Line

Chi^2=9.80855E-04 Adj. R-Square=9.98557E-01 # of Data Points=92

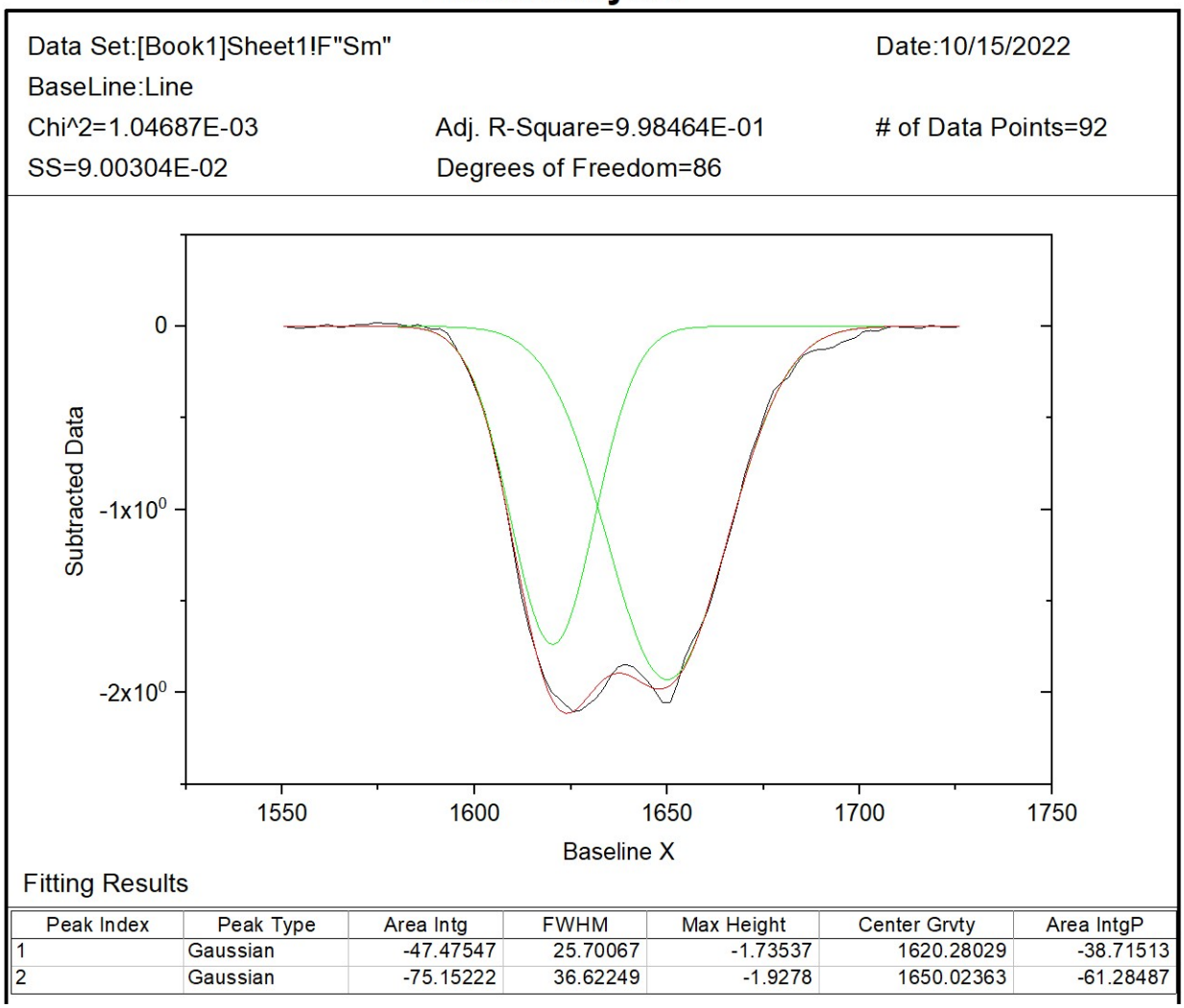
SS=8.43535E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-48.62737	26.30796	-1.73645	1619.56285	-38.73848
2	Gaussian	-76.89995	37.6115	-1.92076	1649.85636	-61.26152

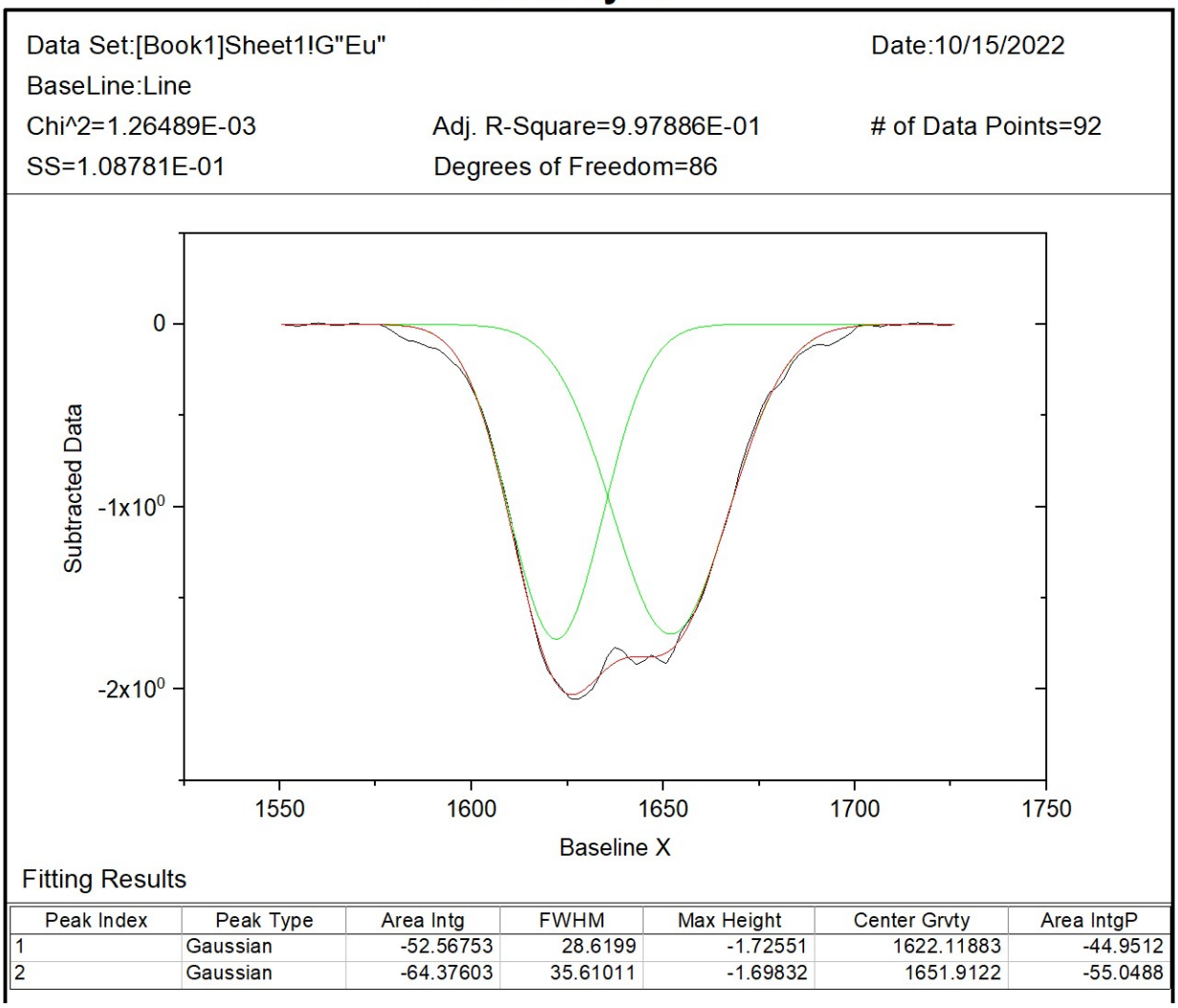
Figure S153. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.



Fitting Results

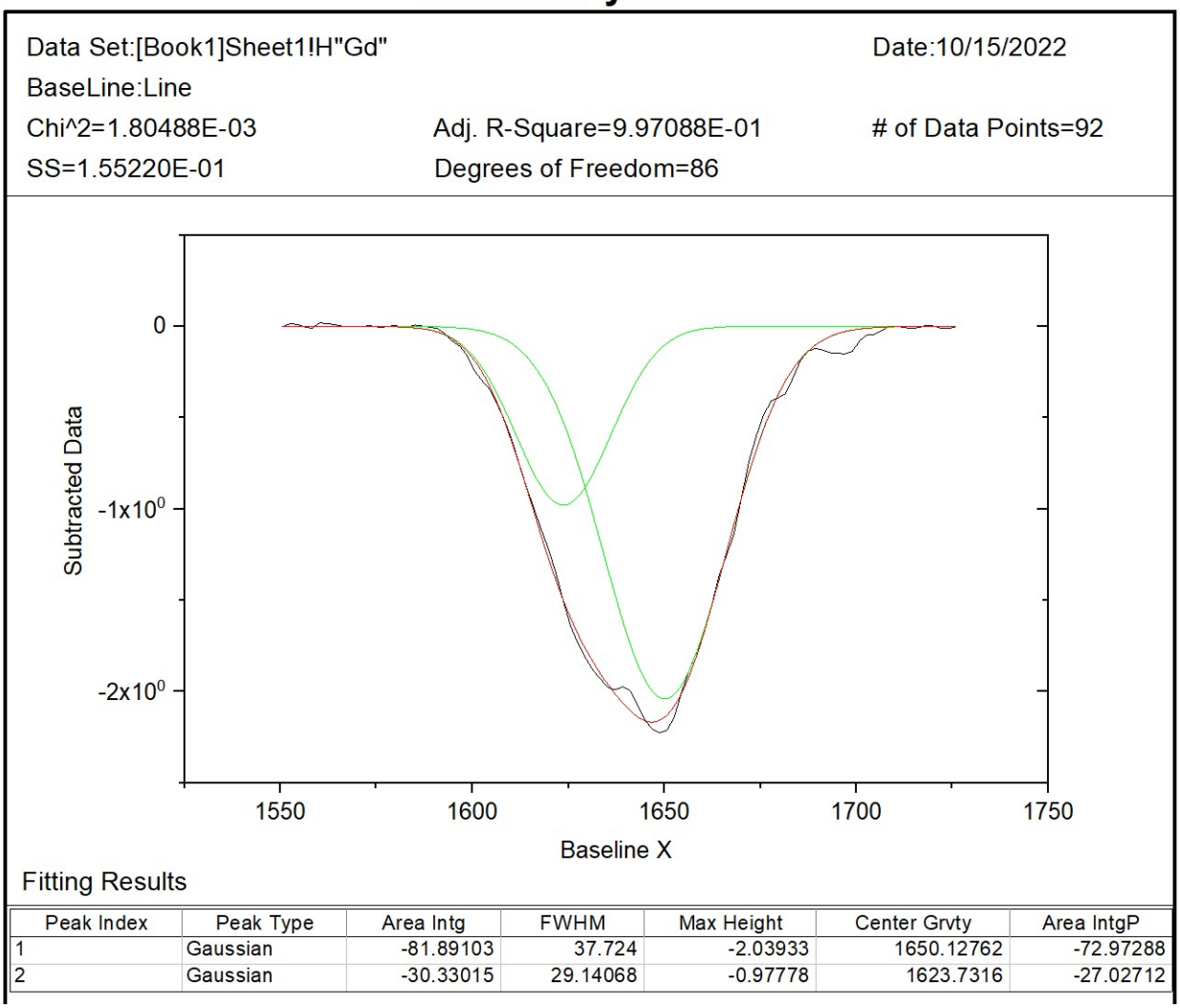
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-47.47547	25.70067	-1.73537	1620.28029	-38.71513
2	Gaussian	-75.15222	36.62249	-1.9278	1650.02363	-61.28487

Figure S154. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.



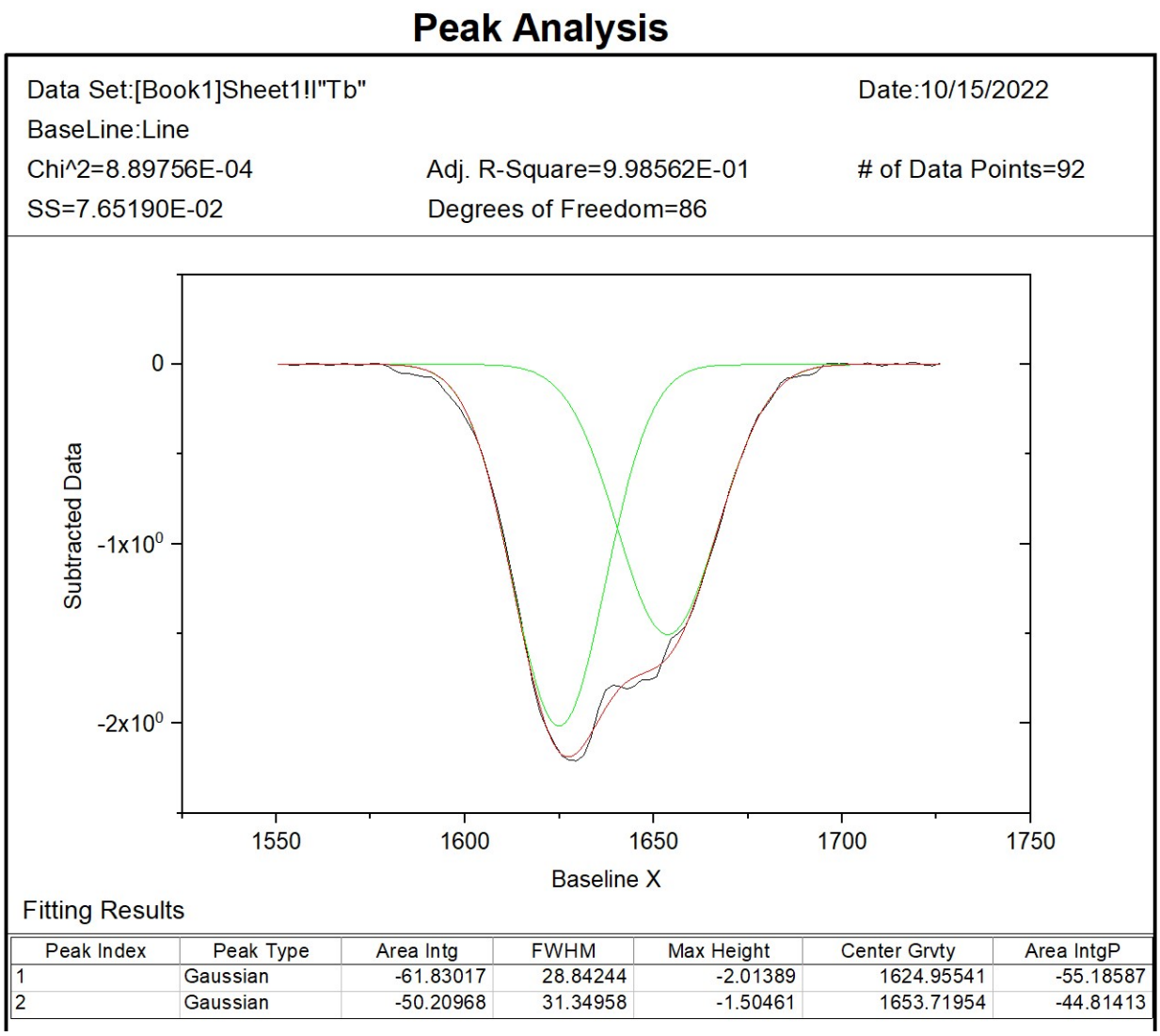
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-52.56753	28.6199	-1.72551	1622.11883	-44.9512
2	Gaussian	-64.37603	35.61011	-1.69832	1651.9122	-55.0488

Figure S155. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-81.89103	37.724	-2.03933	1650.12762	-72.97288
2	Gaussian	-30.33015	29.14068	-0.97778	1623.7316	-27.02712

Figure S156. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-61.83017	28.84244	-2.01389	1624.95541	-55.18587
2	Gaussian	-50.20968	31.34958	-1.50461	1653.71954	-44.81413

Figure S157. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

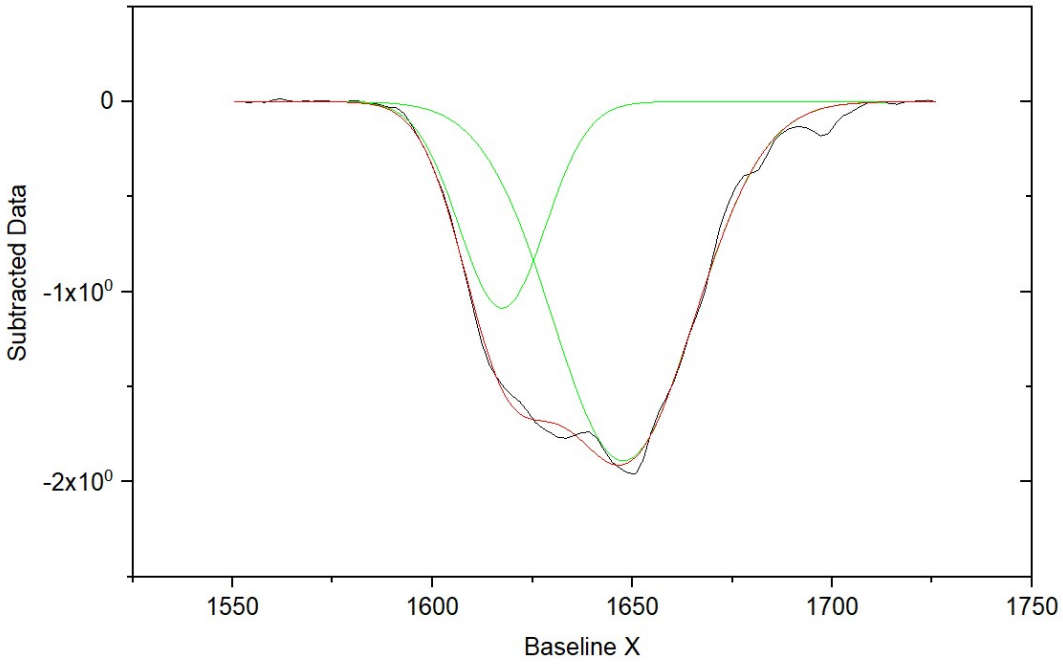
Peak Analysis

Data Set:[Book1]Sheet1!J"Dy" Date:10/15/2022

BaseLine:Line

Chi^2=1.97186E-03 Adj. R-Square=9.96306E-01 # of Data Points=92

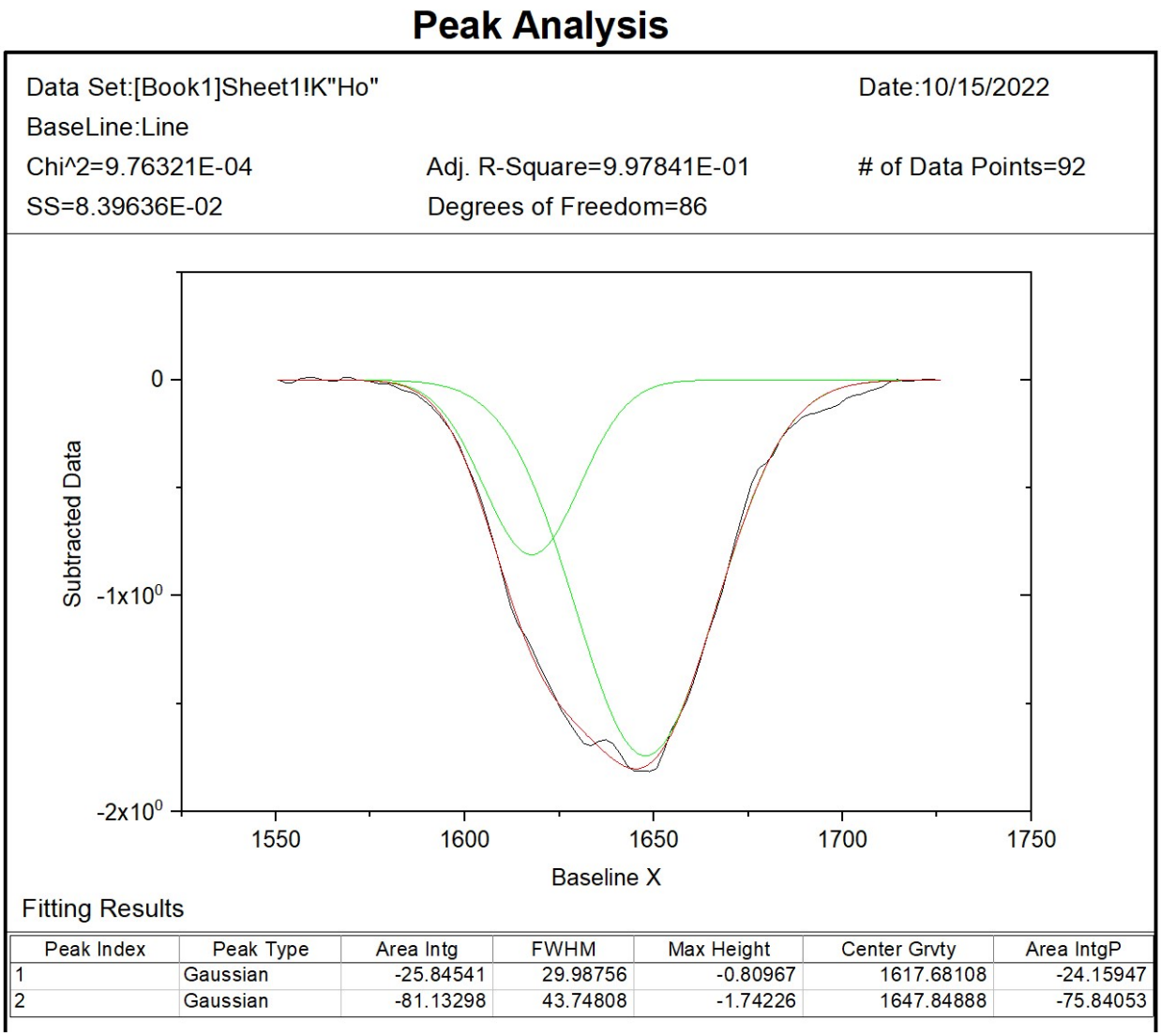
SS=1.69580E-01 Degrees of Freedom=86



Fitting Results

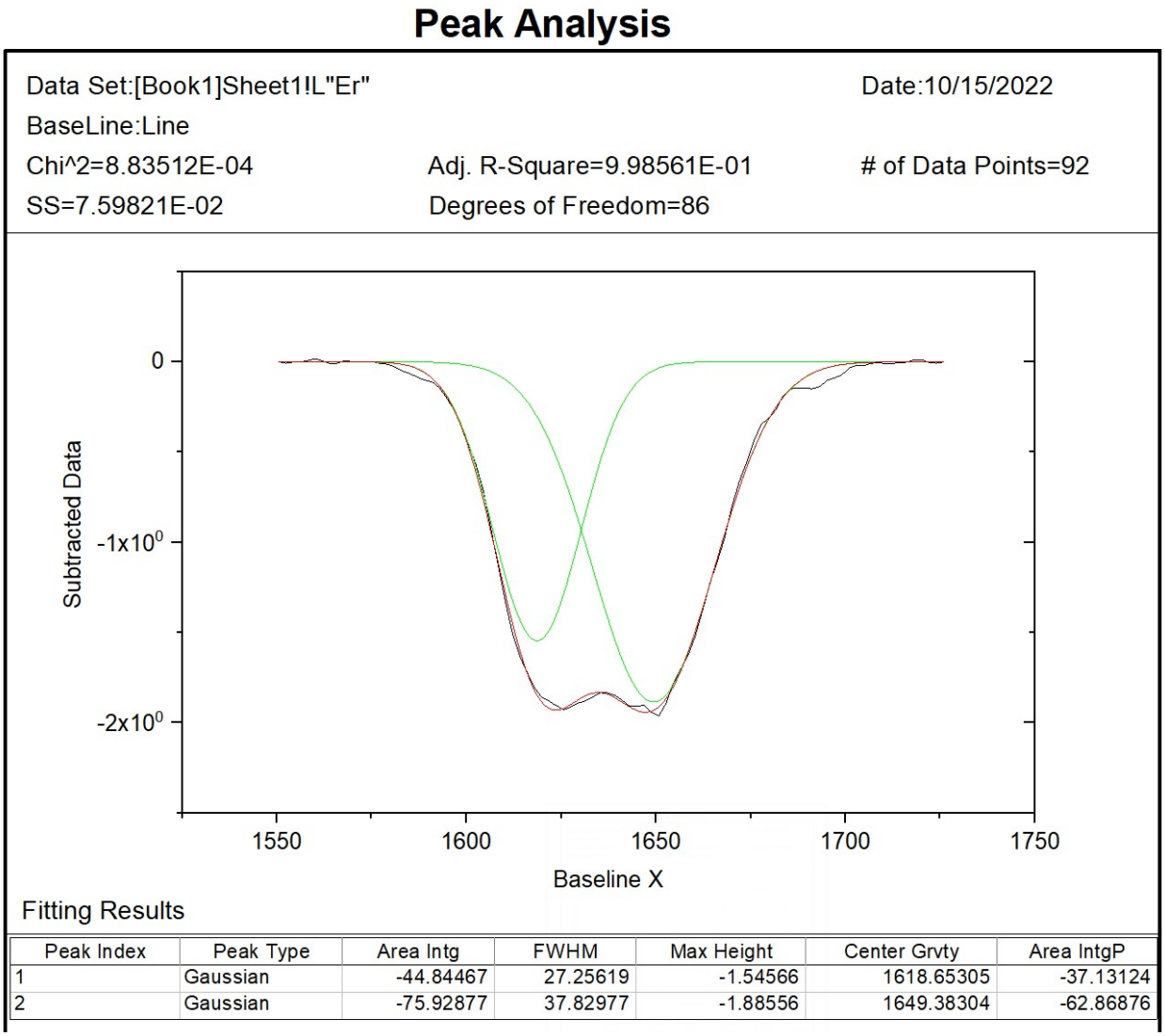
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-29.29041	25.35055	-1.08544	1617.45557	-25.9526
2	Gaussian	-83.57078	41.56018	-1.88907	1647.7539	-74.0474

Figure S158. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.



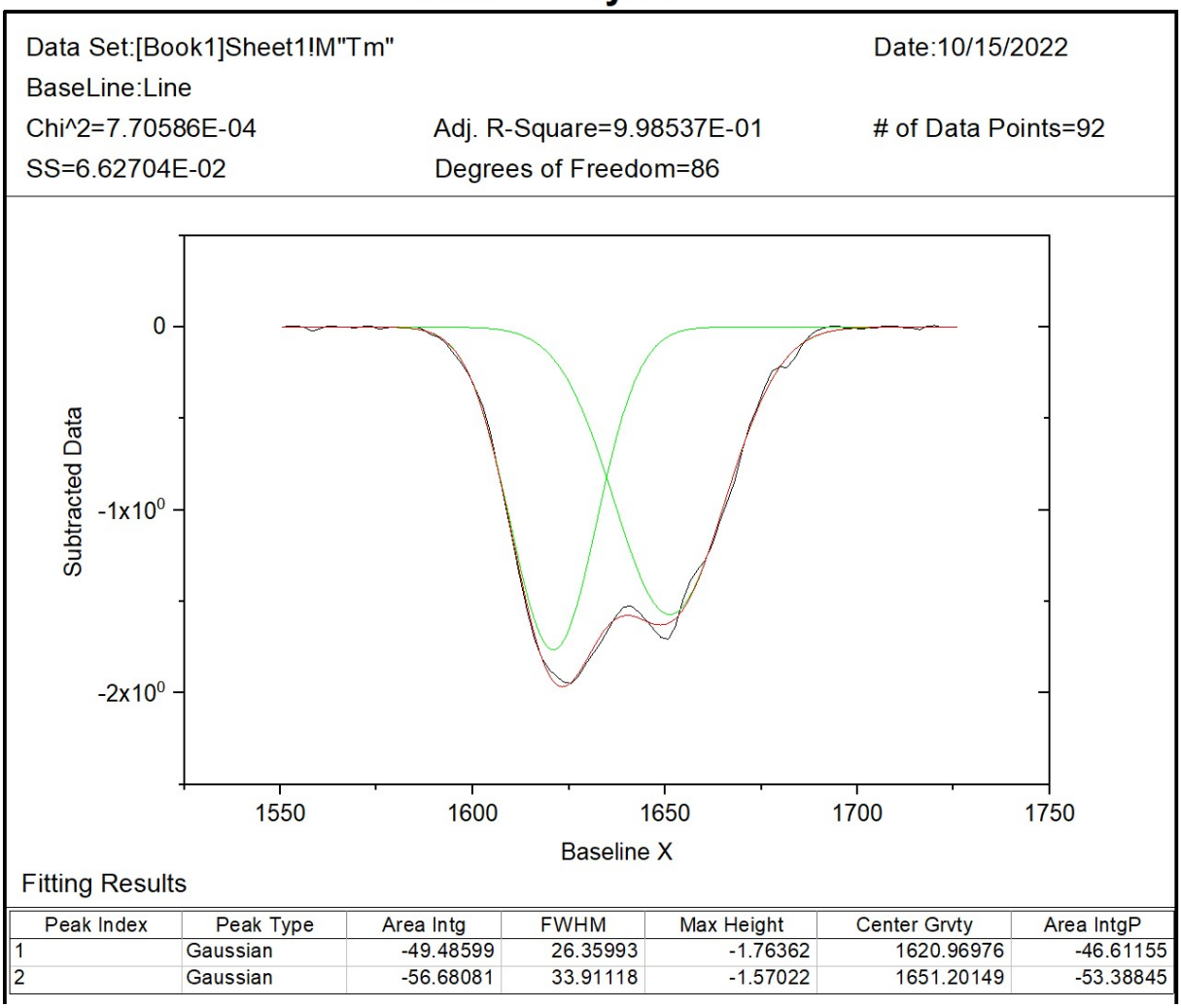
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-25.84541	29.98756	-0.80967	1617.68108	-24.15947
2	Gaussian	-81.13298	43.74808	-1.74226	1647.84888	-75.84053

Figure S159. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-44.84467	27.25619	-1.54566	1618.65305	-37.13124
2	Gaussian	-75.92877	37.82977	-1.88556	1649.38304	-62.86876

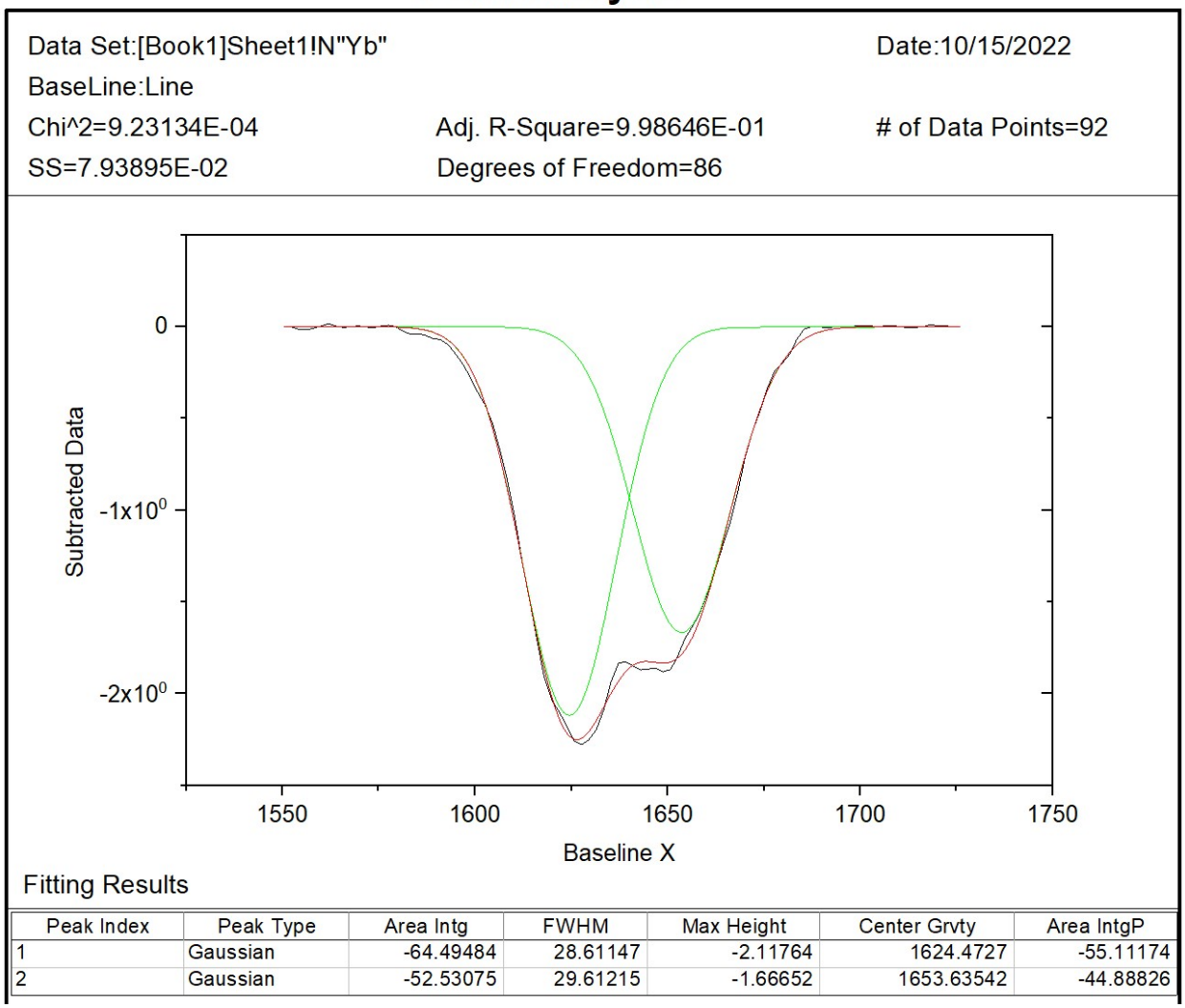
Figure S160. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-49.48599	26.35993	-1.76362	1620.96976	-46.61155
2	Gaussian	-56.68081	33.91118	-1.57022	1651.20149	-53.38845

Figure S161. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-64.49484	28.61147	-2.11764	1624.4727	-55.11174
2	Gaussian	-52.53075	29.61215	-1.66652	1653.63542	-44.88826

Figure S162. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.

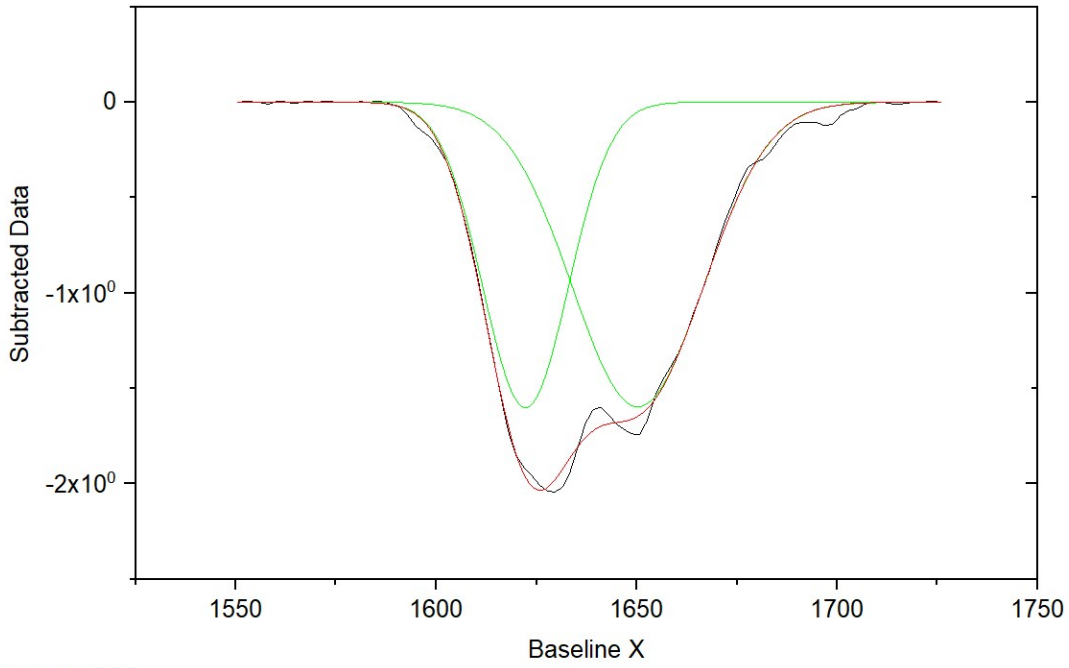
Peak Analysis

Data Set:[Book1]Sheet1!O"Lu" Date:10/15/2022

BaseLine:Line

Chi^2=1.60487E-03 Adj. R-Square=9.97059E-01 # of Data Points=92

SS=1.38019E-01 Degrees of Freedom=86

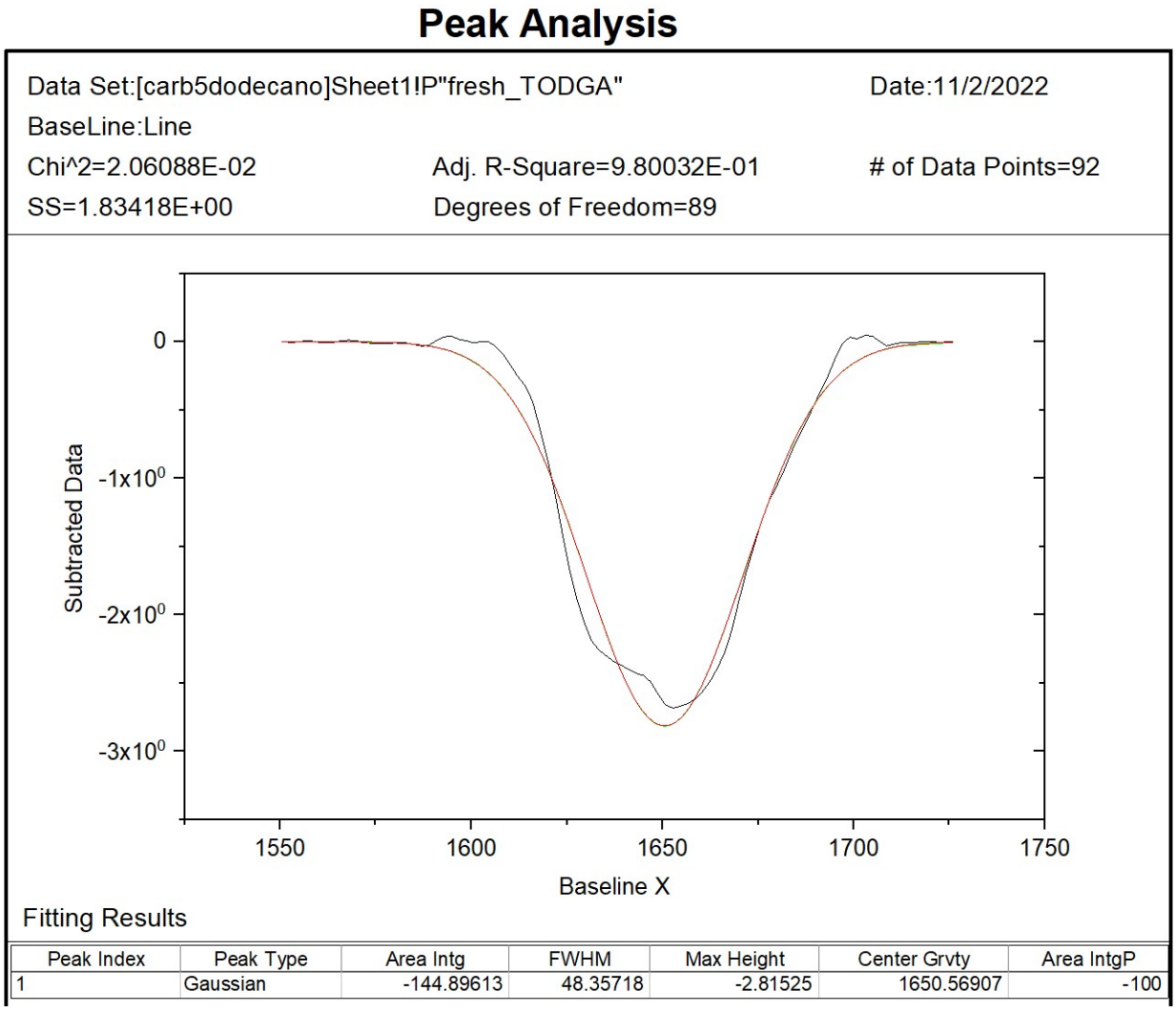


Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-42.70204	25.06377	-1.60055	1622.2842	-39.51475
2	Gaussian	-65.36403	38.46867	-1.59625	1650.28993	-60.48525

Figure S163. Peak analysis via OriginLab for 0.04 M TODGA with 30 vol% 1-decanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.

5 vol% 1-dodecanol



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-144.89613	48.35718	-2.81525	1650.56907	-100

Figure S164. Peak analysis via OriginLab for 0.04 M of fresh TODGA with 5 vol% 1-dodecanol in n-dodecane.

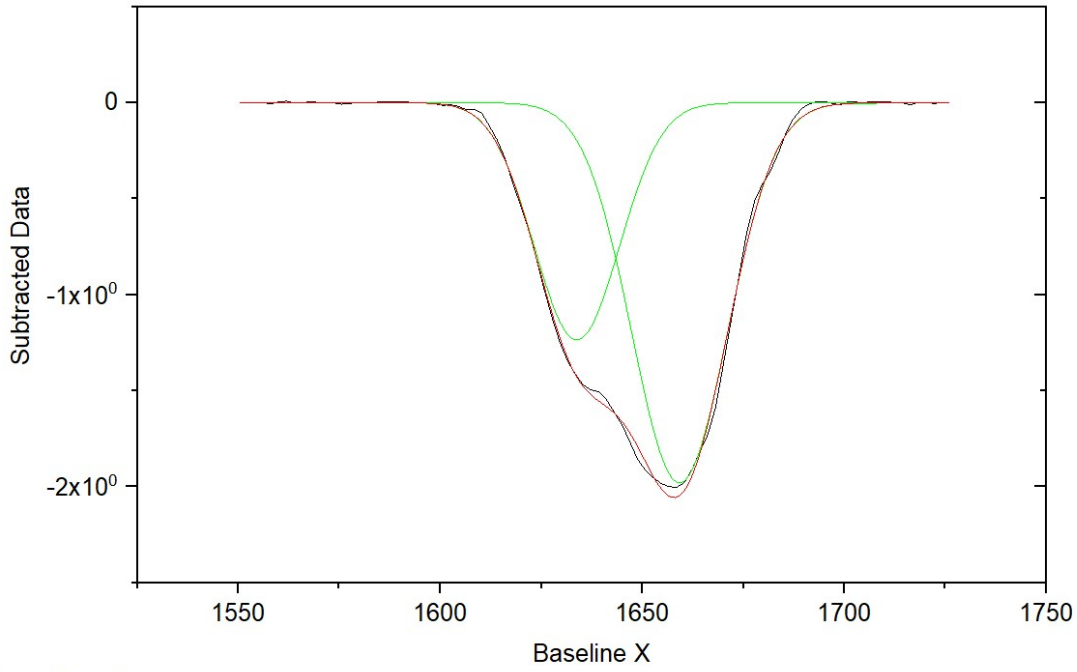
Peak Analysis

Data Set:[carb5dodecano]Sheet1!Q"preeqm_TODGA" Date:11/2/2022

BaseLine:Line

Chi^2=7.24016E-04 Adj. R-Square=9.98603E-01 # of Data Points=92

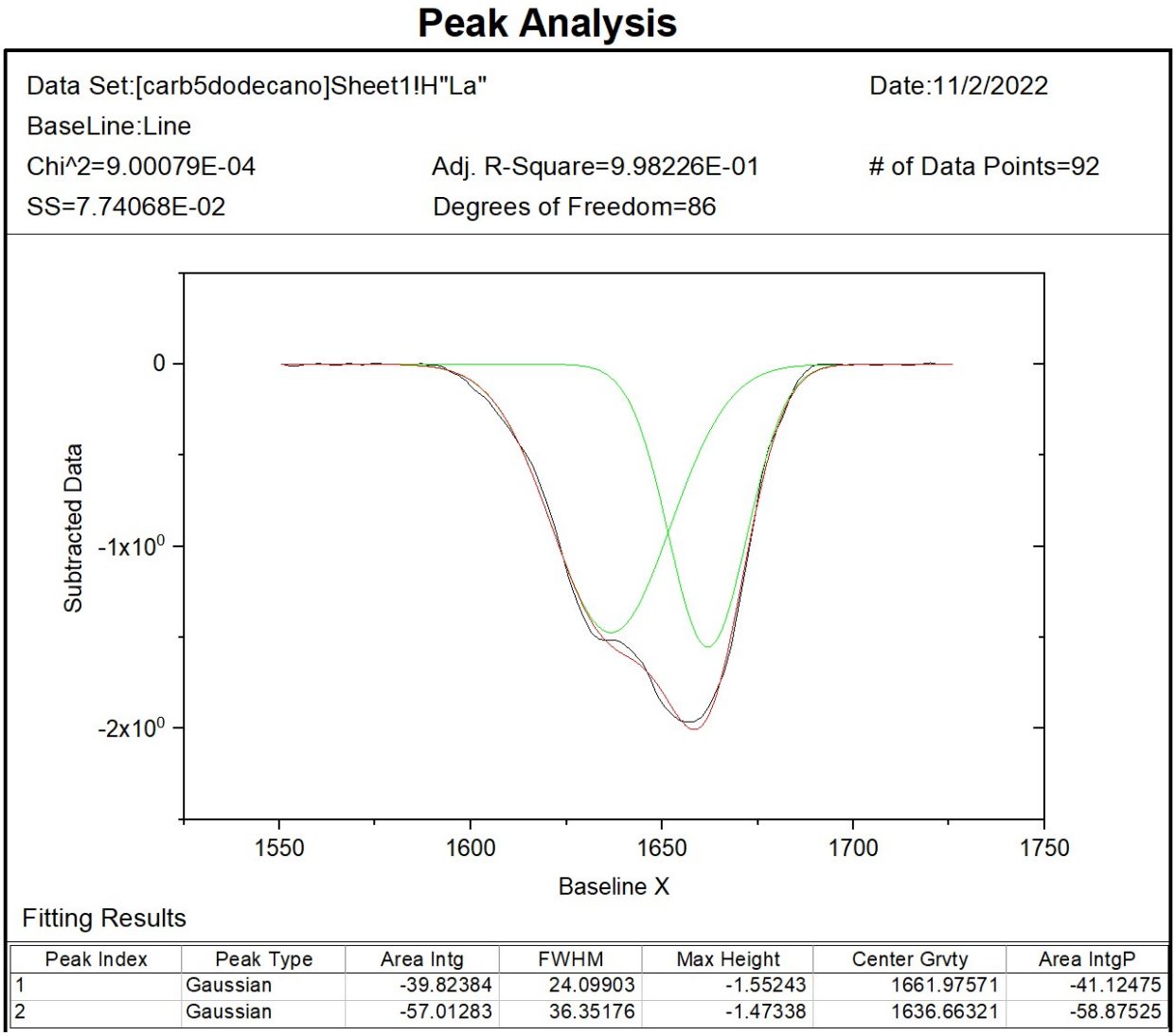
SS=6.22654E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-58.66347	27.84912	-1.9789	1659.23201	-64.26718
2	Gaussian	-32.61714	24.82368	-1.23438	1633.80001	-35.73282

Figure S165. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-39.82384	24.09903	-1.55243	1661.97571	-41.12475
2	Gaussian	-57.01283	36.35176	-1.47338	1636.66321	-58.87525

Figure S166. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $La(NO_3)_3$ in 1 M HNO_3.

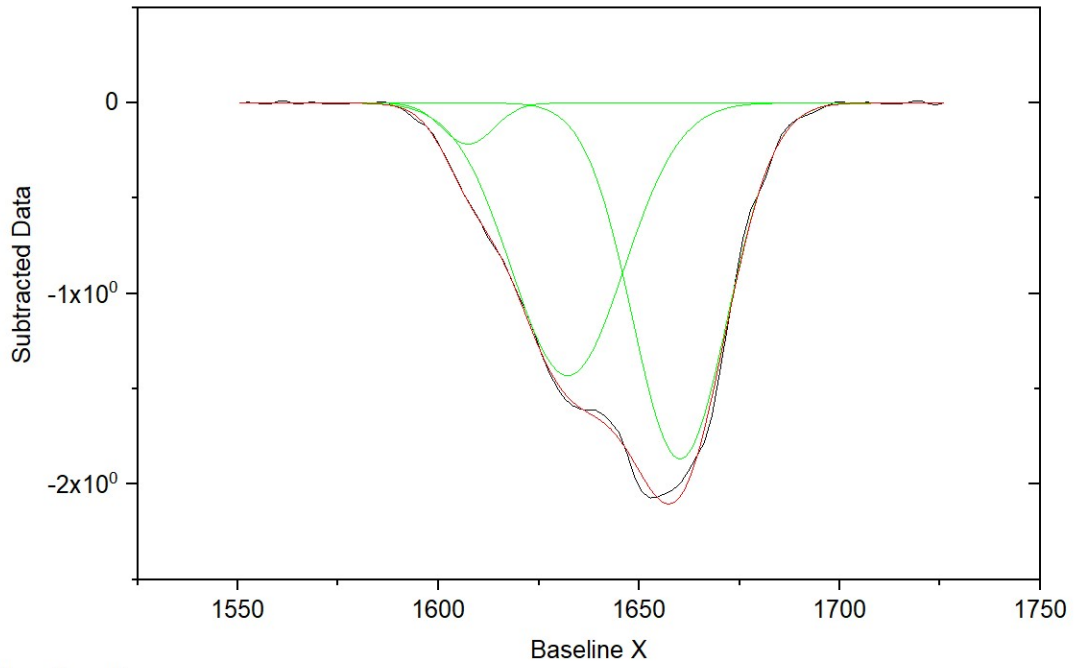
Peak Analysis

Data Set:[carb5dodecano]Sheet1!B"Ce" Date:11/2/2022

BaseLine:Line

Chi^2=8.61974E-04 Adj. R-Square=9.98456E-01 # of Data Points=92

SS=7.15439E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-55.22131	27.78916	-1.86681	1660.17897	-50.56761
2	Gaussian	-50.46074	33.13622	-1.4306	1632.20312	-46.20823
3	Gaussian	-3.52088	15.30689	-0.21609	1607.37859	-3.22416

Figure S167. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Ce(NO_3)_3$ in 1 M HNO_3.

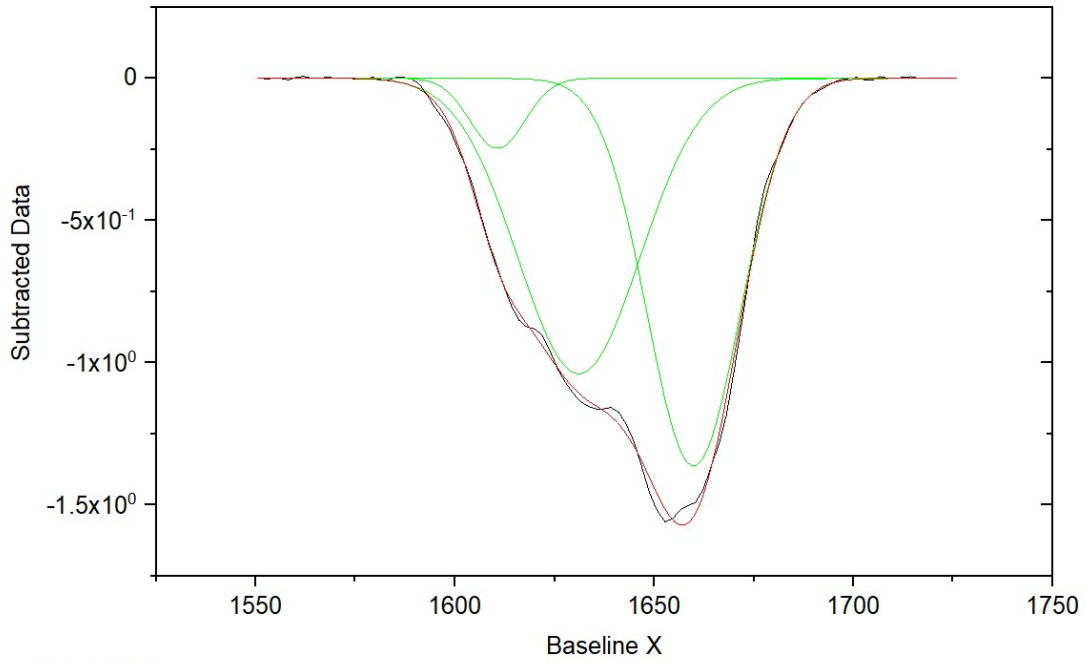
Peak Analysis

Data Set:[carb5dodecano]Sheet1!K"Pr" Date:11/2/2022

BaseLine:Line

Chi^2=5.33840E-04 Adj. R-Square=9.98282E-01 # of Data Points=92

SS=4.43087E-02 Degrees of Freedom=83



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-39.98271	36.16066	-1.03873	1631.11682	-47.47226
2	Gaussian	-39.9901	27.57819	-1.36224	1659.90719	-47.48103
3	Gaussian	-4.2505	16.20619	-0.24639	1610.68162	-5.04671

Figure S168. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Pr(NO_3)_3$ in 1 M HNO_3.

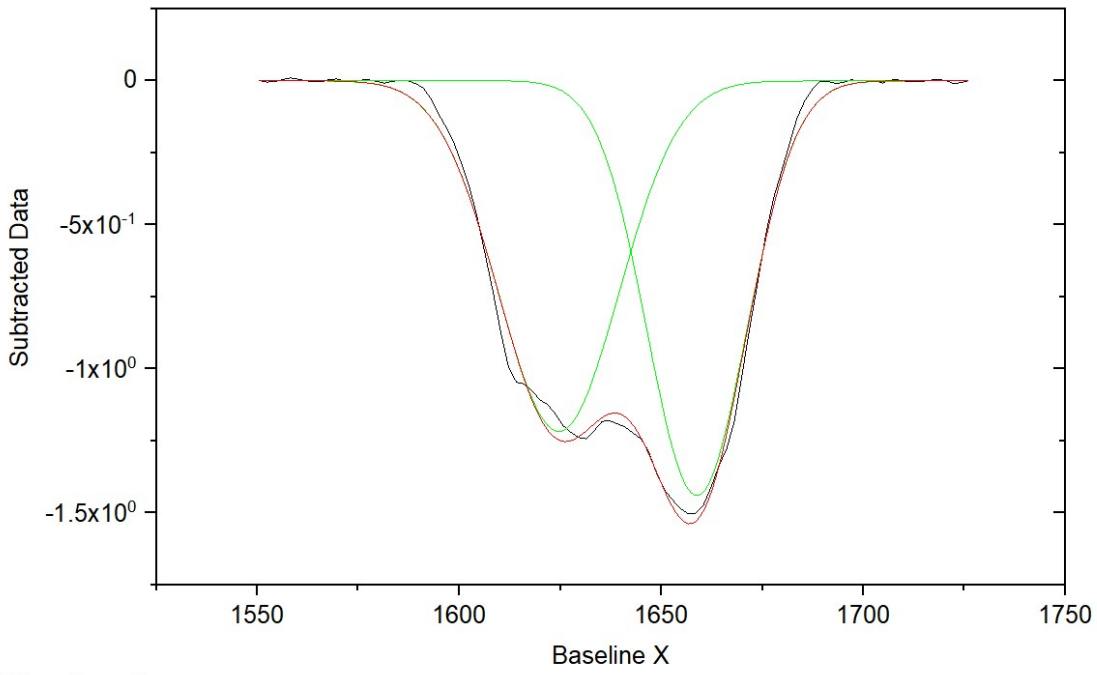
Peak Analysis

Data Set:[carb5dodecano]Sheet1!J"Nd" Date:11/2/2022

BaseLine:Line

Chi^2=1.62696E-03 Adj. R-Square=9.95054E-01 # of Data Points=92

SS=1.39919E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-45.43808	35.04962	-1.21788	1624.60896	-50.64601
2	Gaussian	-44.27893	28.88293	-1.4402	1658.80951	-49.35399

Figure S169. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Nd(NO_3)_3$ in 1 M HNO_3.

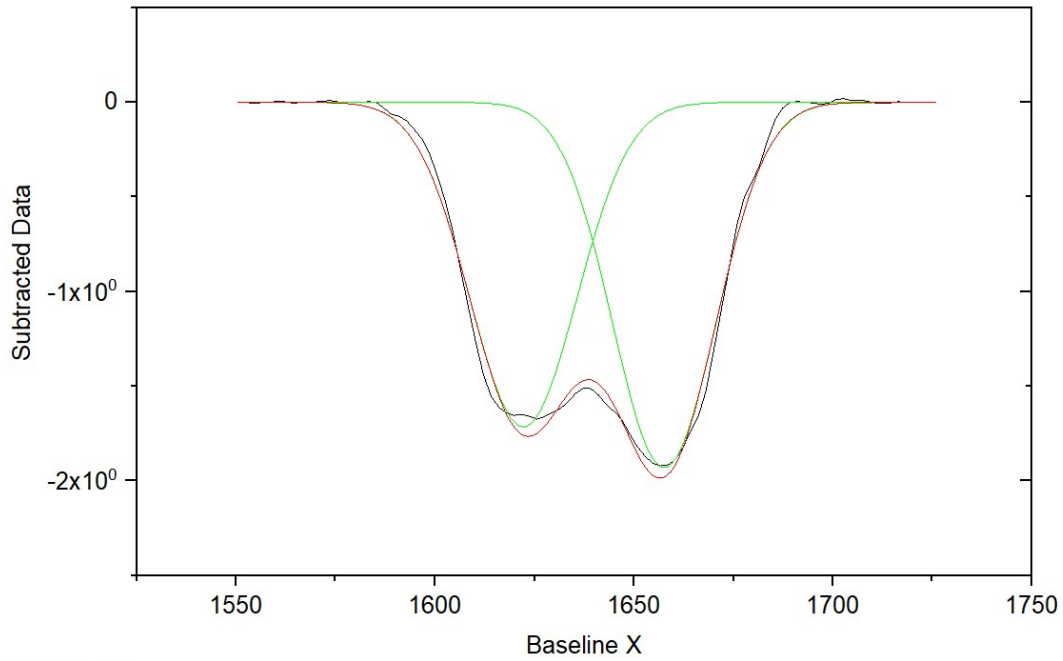
Peak Analysis

Data Set:[carb5dodecano]Sheet1!L"Sm" Date:11/2/2022

BaseLine:Line

Chi^2=2.98908E-03 Adj. R-Square=9.94856E-01 # of Data Points=92

SS=2.57061E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-57.56198	31.54236	-1.71439	1622.20198	-47.9085
2	Gaussian	-62.58784	30.47485	-1.92937	1657.62544	-52.0915

Figure S170. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Sm(NO_3)_3$ in 1 M HNO_3.

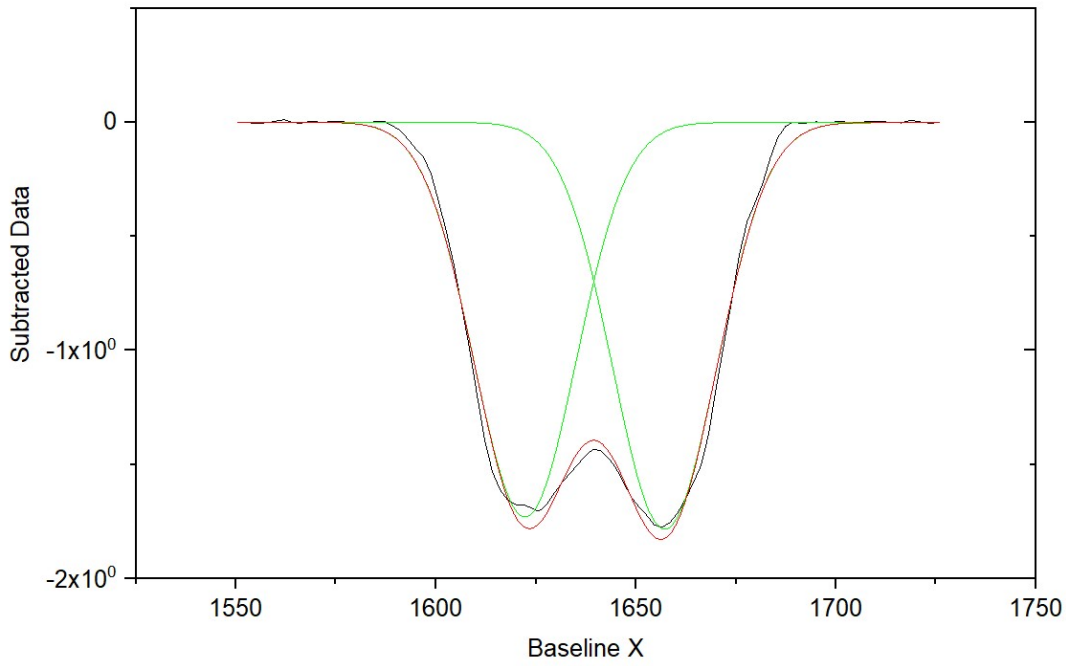
Peak Analysis

Data Set:[carb5dodecano]Sheet1!E"Eu" Date:11/2/2022

BaseLine:Line

Chi^2=2.38449E-03 Adj. R-Square=9.95511E-01 # of Data Points=92

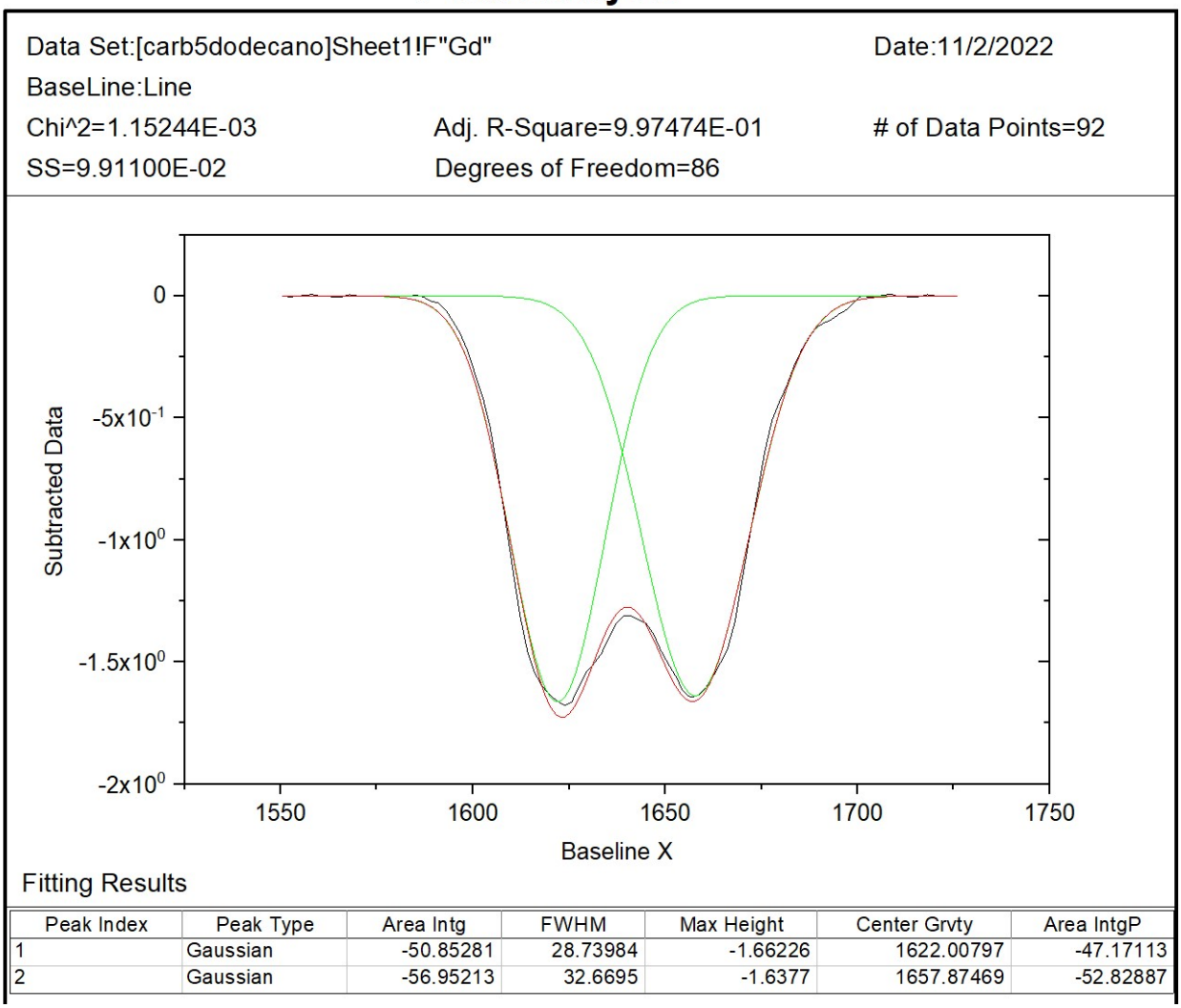
SS=2.05066E-01 Degrees of Freedom=86



Fitting Results

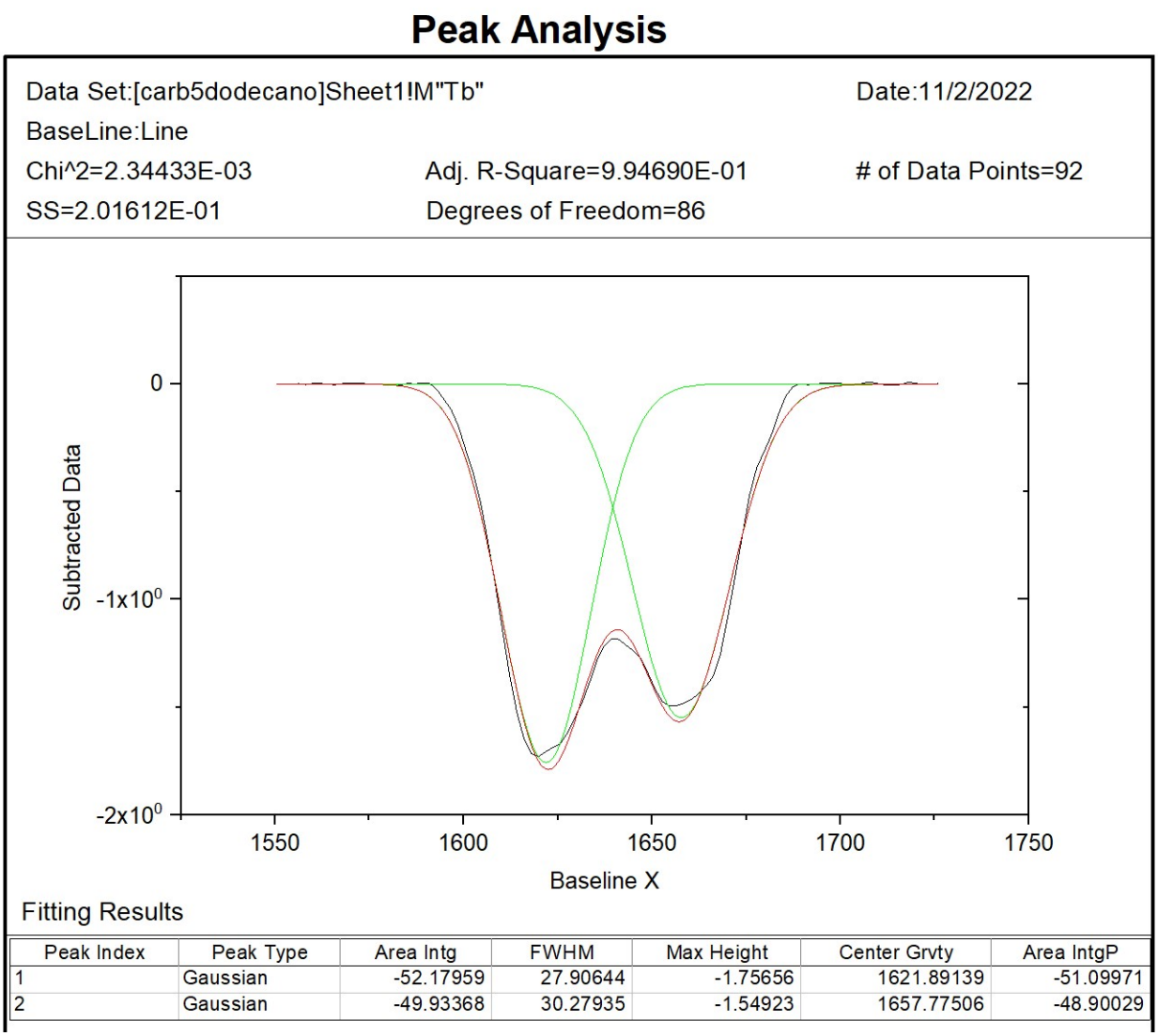
Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-55.31579	30.01834	-1.73113	1622.27691	-48.87291
2	Gaussian	-57.86714	30.45681	-1.78491	1657.20432	-51.12709

Figure S171. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Eu(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-50.85281	28.73984	-1.66226	1622.00797	-47.17113
2	Gaussian	-56.95213	32.6695	-1.6377	1657.87469	-52.82887

Figure S172. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Gd(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-52.17959	27.90644	-1.75656	1621.89139	-51.09971
2	Gaussian	-49.93368	30.27935	-1.54923	1657.77506	-48.90029

Figure S173. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Tb(NO_3)_3$ in 1 M HNO_3.

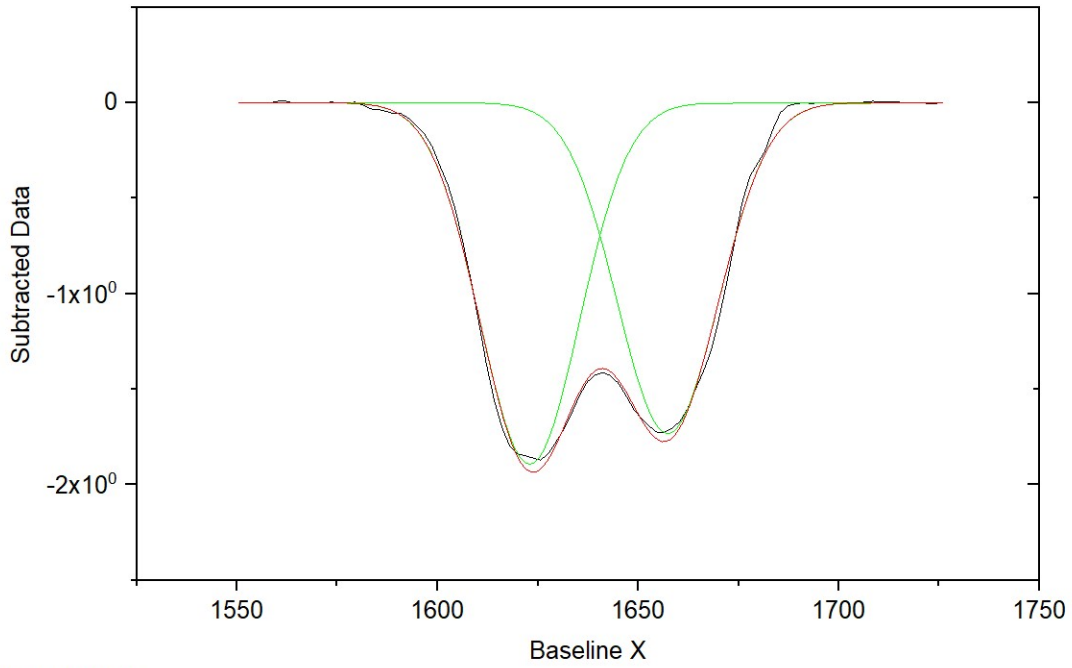
Peak Analysis

Data Set:[carb5dodecano]Sheet1!C"Dy" Date:11/2/2022

BaseLine:Line

Chi^2=1.44387E-03 Adj. R-Square=9.97359E-01 # of Data Points=92

SS=1.24173E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-58.69886	29.15524	-1.89139	1622.97657	-51.91127
2	Gaussian	-54.3765	29.51241	-1.73091	1657.39407	-48.08873

Figure S174. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Dy(NO_3)_3$ in 1 M HNO_3.

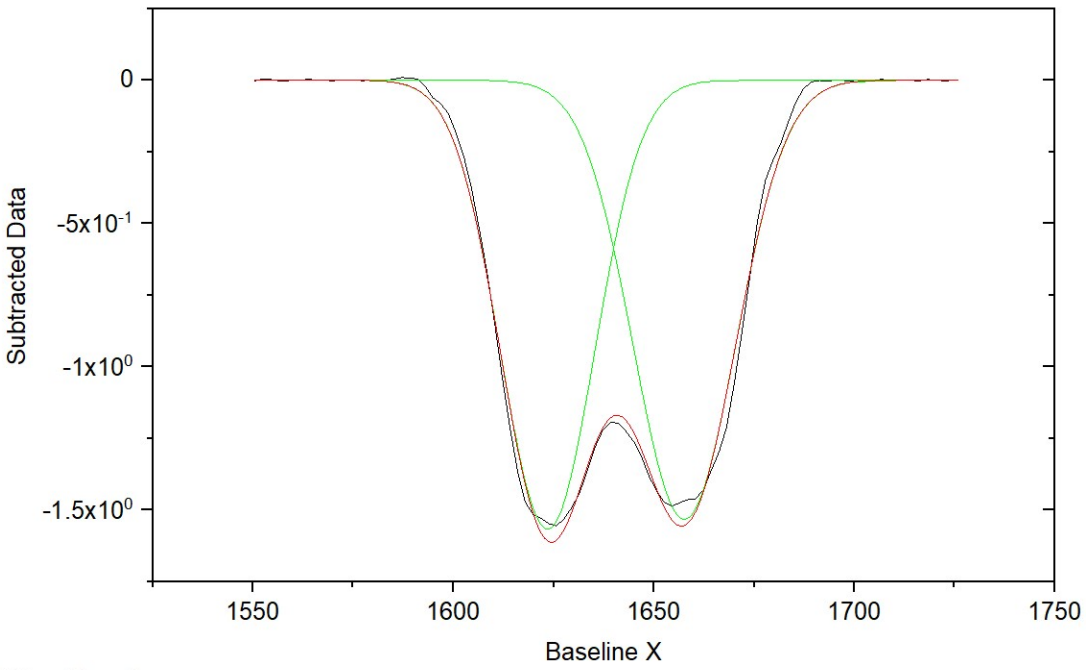
Peak Analysis

Data Set:[carb5dodecano]Sheet1!G"Ho" Date:11/2/2022

BaseLine:Line

Chi^2=1.64386E-03 Adj. R-Square=9.95865E-01 # of Data Points=92

SS=1.41372E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-46.05148	27.61055	-1.56688	1623.50703	-48.48815
2	Gaussian	-48.92323	29.98522	-1.53277	1657.61713	-51.51185

Figure S175. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Ho(NO_3)_3$ in 1 M HNO_3.

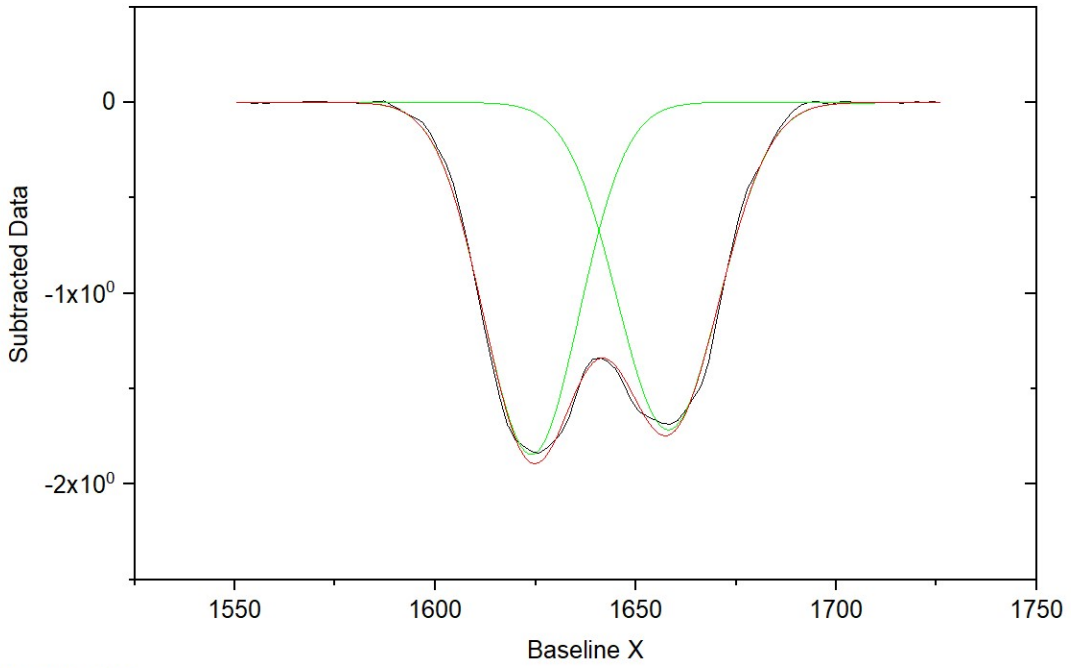
Peak Analysis

Data Set:[carb5dodecano]Sheet1!D"Er" Date:11/2/2022

BaseLine:Line

Chi^2=1.03273E-03 Adj. R-Square=9.98009E-01 # of Data Points=92

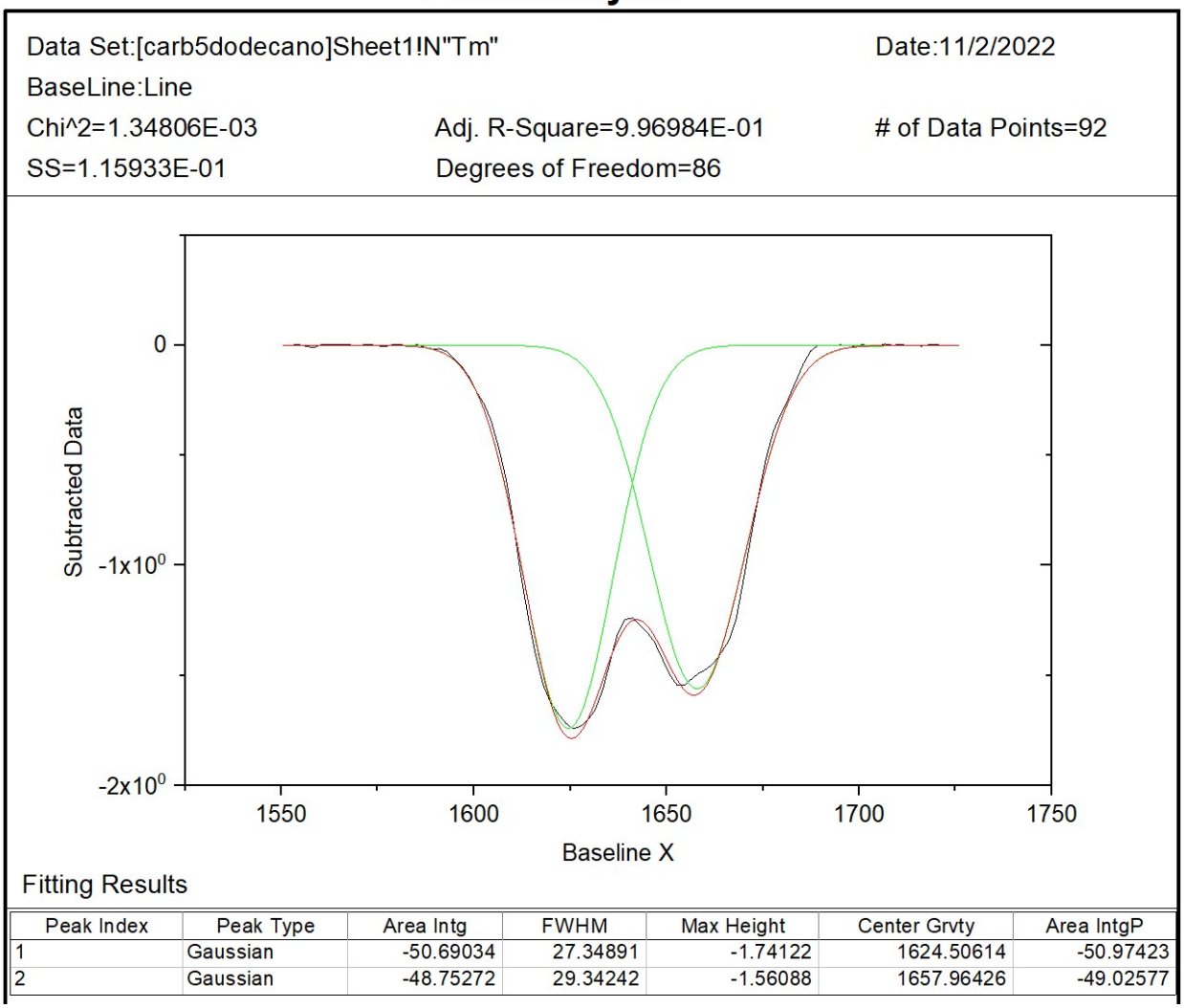
SS=8.88151E-02 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-54.83546	27.92849	-1.84451	1623.94966	-50.22854
2	Gaussian	-54.33647	29.77386	-1.71445	1658.13431	-49.77146

Figure S176. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Er(NO_3)_3$ in 1 M HNO_3.



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-50.69034	27.34891	-1.74122	1624.50614	-50.97423
2	Gaussian	-48.75272	29.34242	-1.56088	1657.96426	-49.02577

Figure S177. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Tm(NO_3)_3$ in 1 M HNO_3.

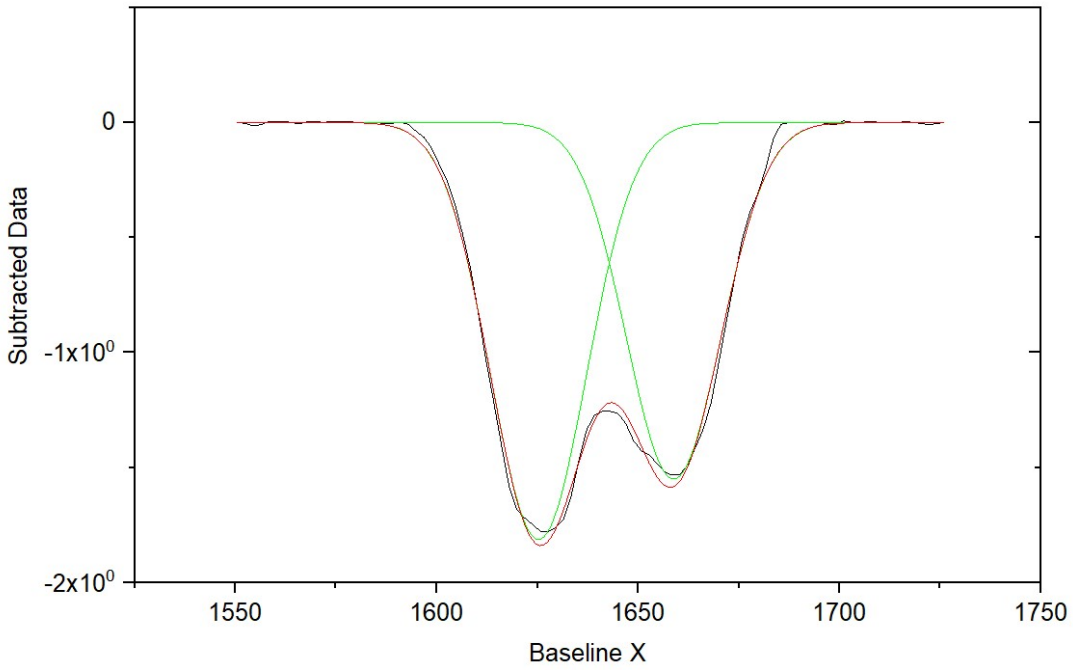
Peak Analysis

Data Set:[carb5dodecano]Sheet1!O"Yb" Date:11/2/2022

BaseLine:Line

Chi^2=1.30500E-03 Adj. R-Square=9.97151E-01 # of Data Points=92

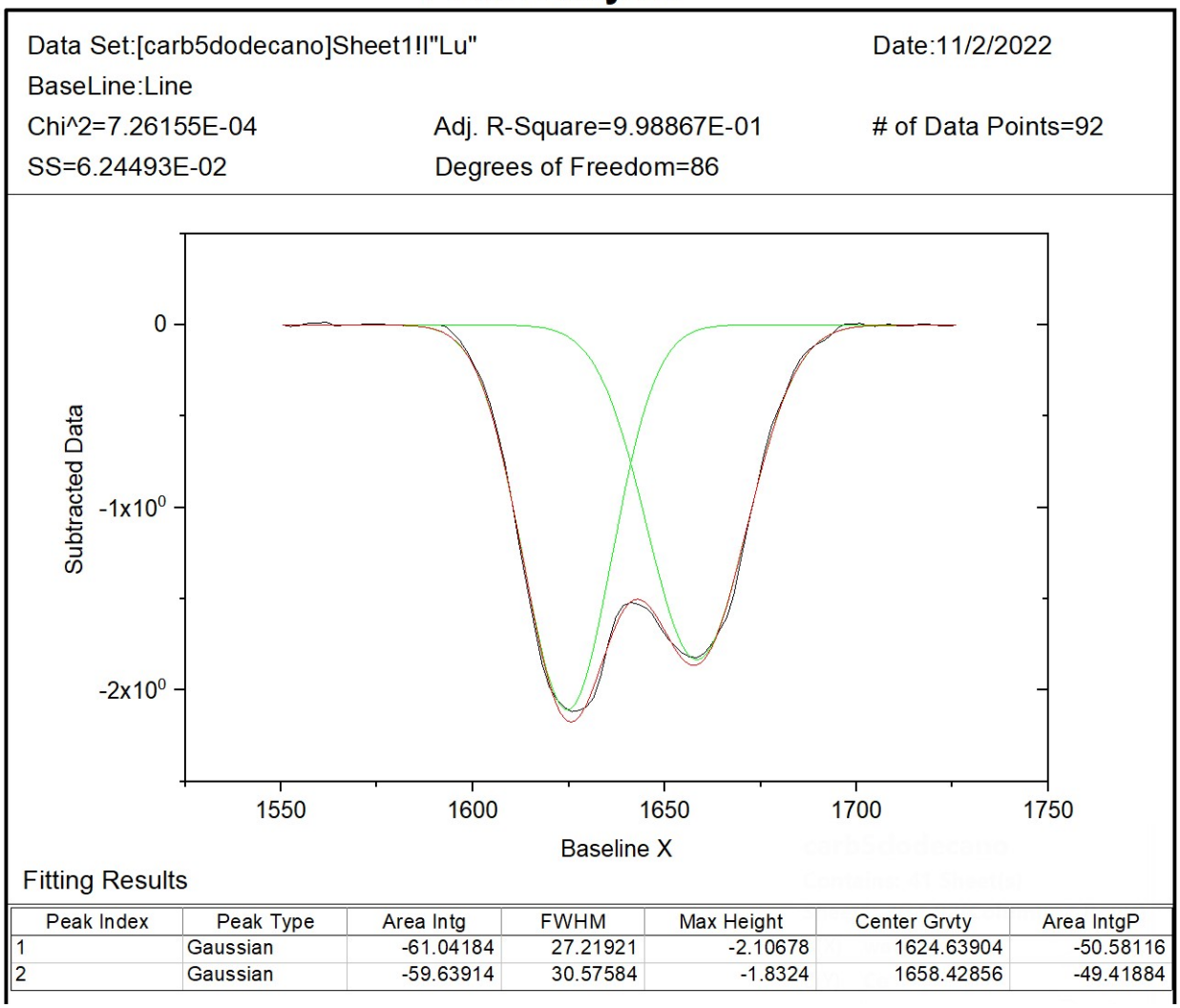
SS=1.12230E-01 Degrees of Freedom=86



Fitting Results

Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-54.08576	28.01856	-1.81345	1625.28242	-54.33491
2	Gaussian	-45.4557	27.54311	-1.5504	1658.82783	-45.66509

Figure S178. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Yb(NO_3)_3$ in 1 M HNO_3.



Peak Index	Peak Type	Area Intg	FWHM	Max Height	Center Grvty	Area IntgP
1	Gaussian	-61.04184	27.21921	-2.10678	1624.63904	-50.58116
2	Gaussian	-59.63914	30.57584	-1.8324	1658.42856	-49.41884

Figure S179. Peak analysis via OriginLab for 0.04 M TODGA with 5 vol% 1-dodecanol in n-dodecane after contact with 3 mM $Lu(NO_3)_3$ in 1 M HNO_3.