

Figure 1

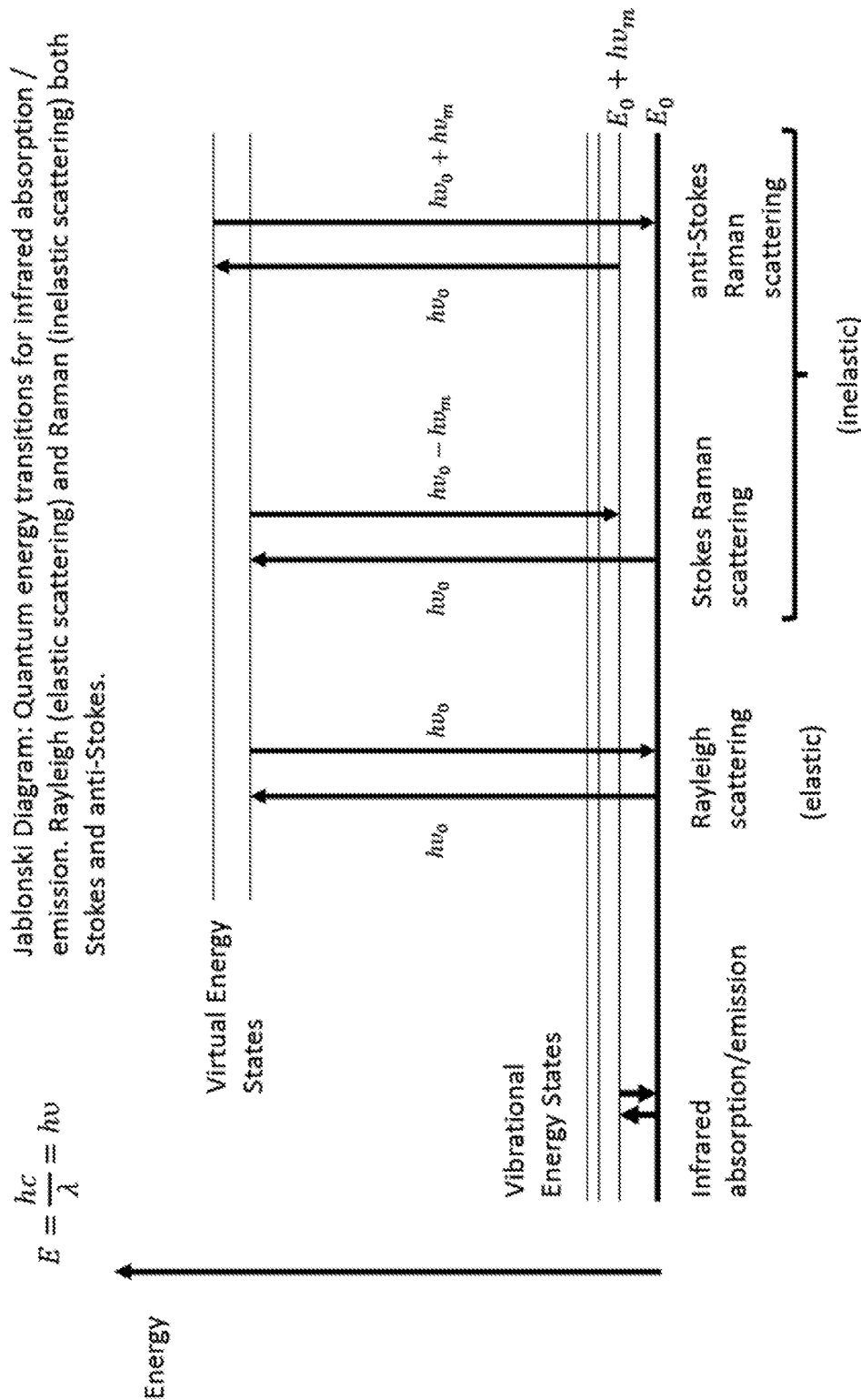


Figure 2

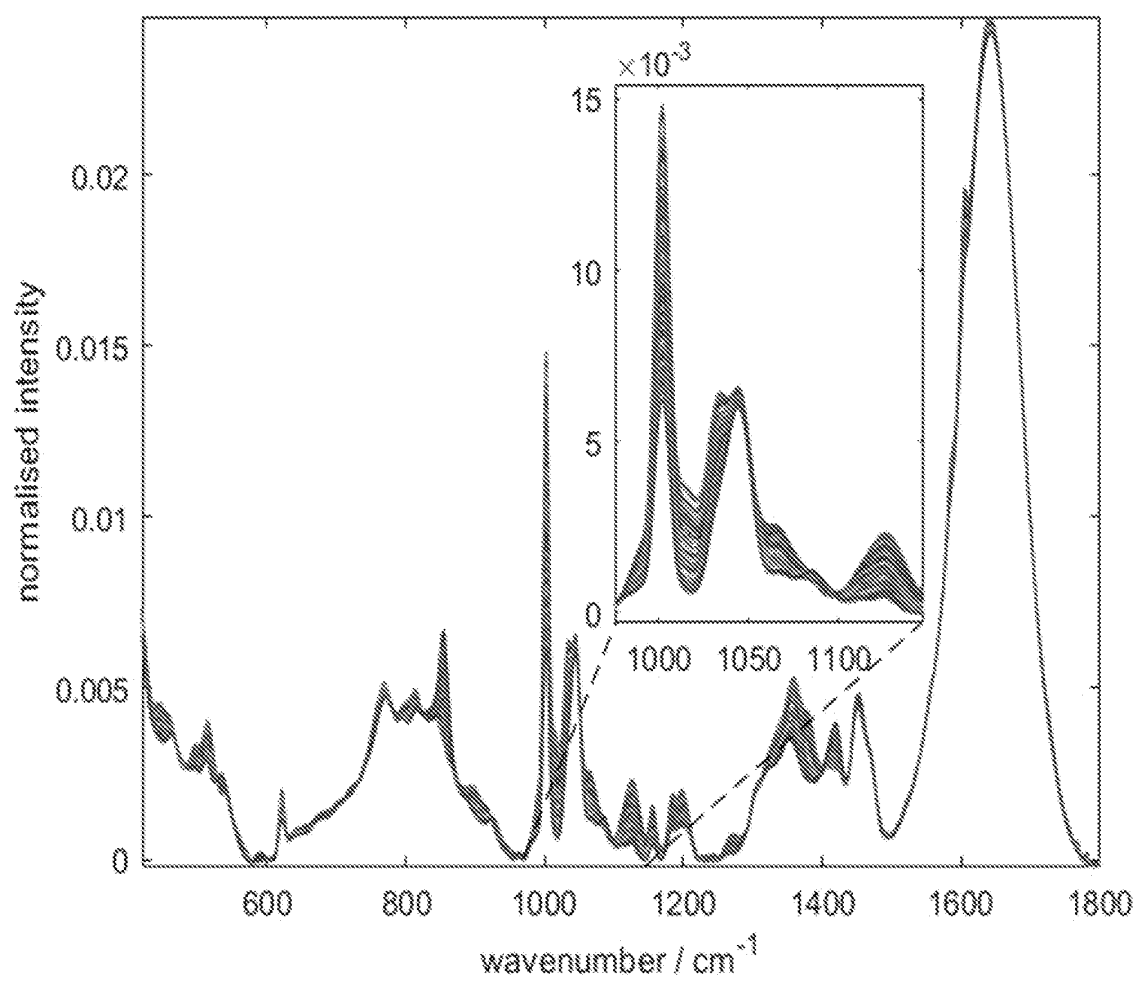


Figure 3

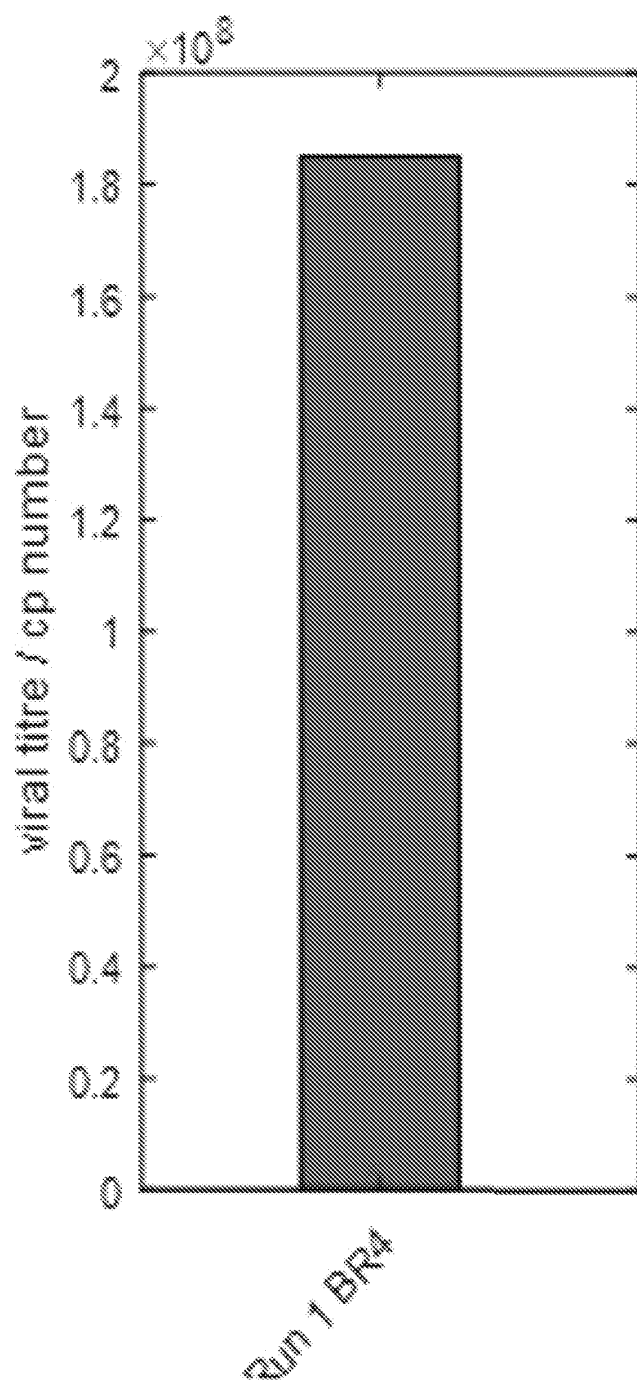


Figure 4

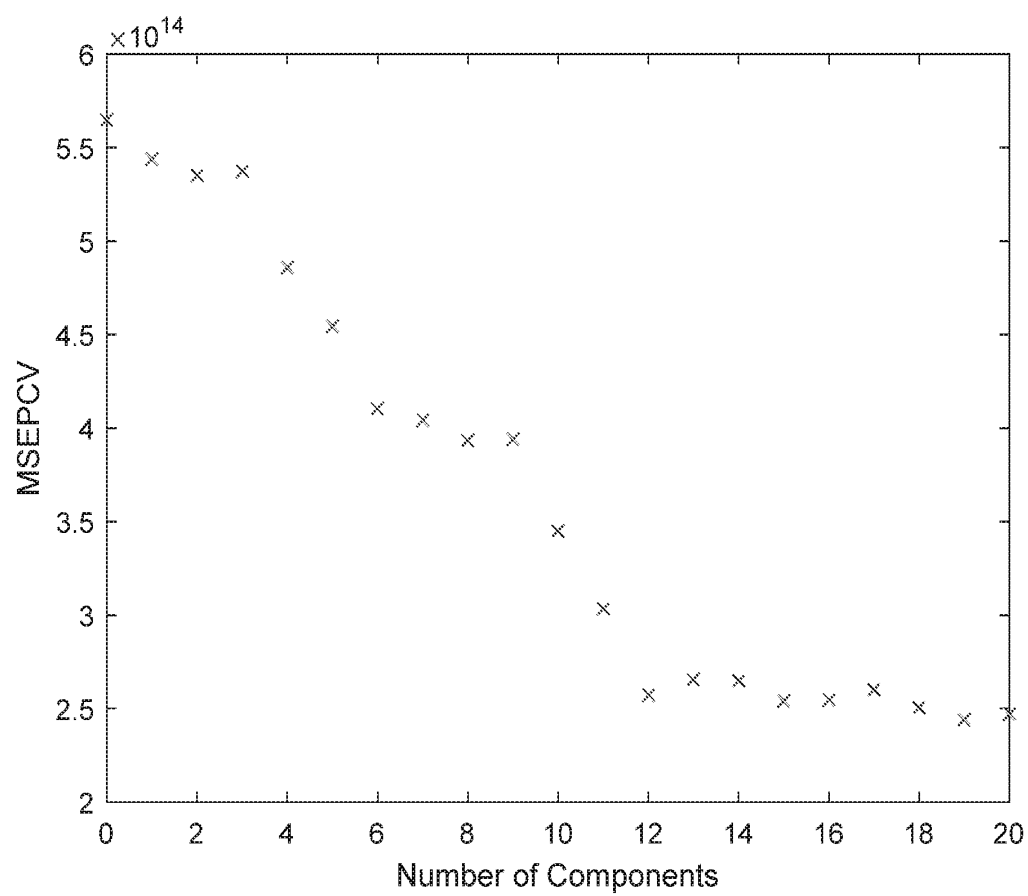
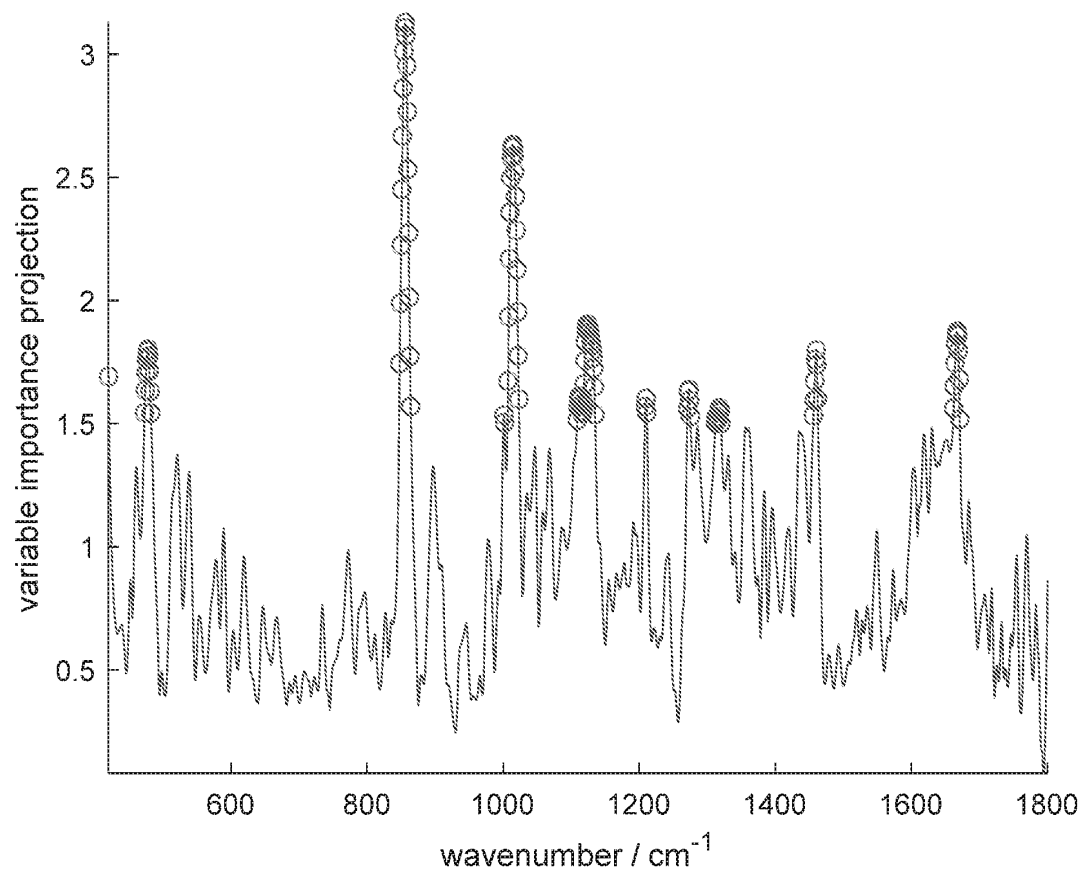


Figure 5

A



B

Variable Ranges / cm^{-1}
420
473-481
848-863
1001
1007-1022
1109-1134
1209-1210
1271-1274
1312-1319
1456-1461
1662-1671

Figure 5 (continued)

C

<u>Wavenumber Range / cm-1</u>	<u>Peak VIP</u>	<u>Integrated VIP</u>	<u>Integrated VIP as % of Total Integrated VIP</u>
1109 - 1134	1.9030	44.7182	24
848 - 863	3.1279	40.5701	21
1007-1022	2.6319	36.7527	19
1662 - 1671	1.8745	17.3666	9
473 - 481	1.8006	15.3503	8
1312 - 1319	1.5638	12.2383	6
1456 - 1461	1.7977	10.0990	5
1271 - 1274	1.6370	6.4248	3
1209 - 1210	1.6015	3.1708	2
420	1.6907	1.6907	1
1001	1.5333	1.5333	1

Figure 6

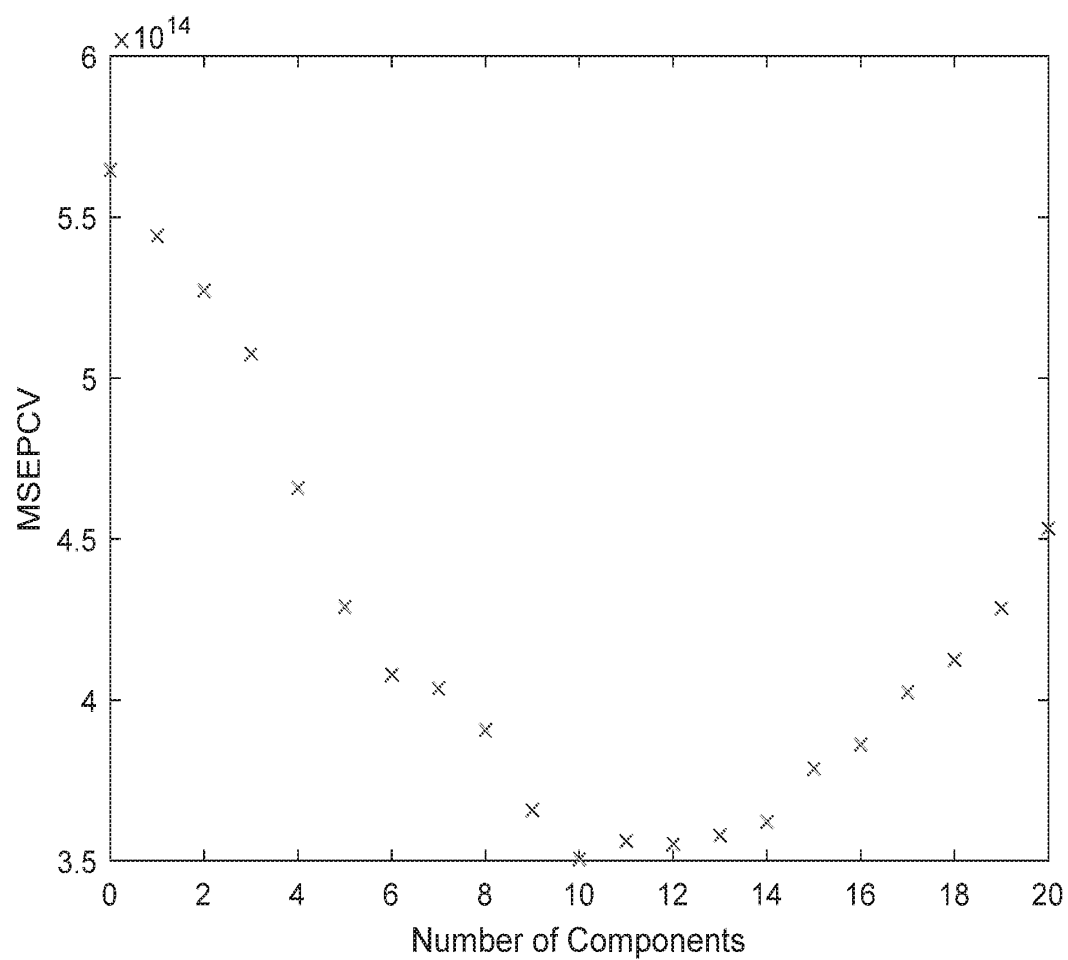


Figure 7

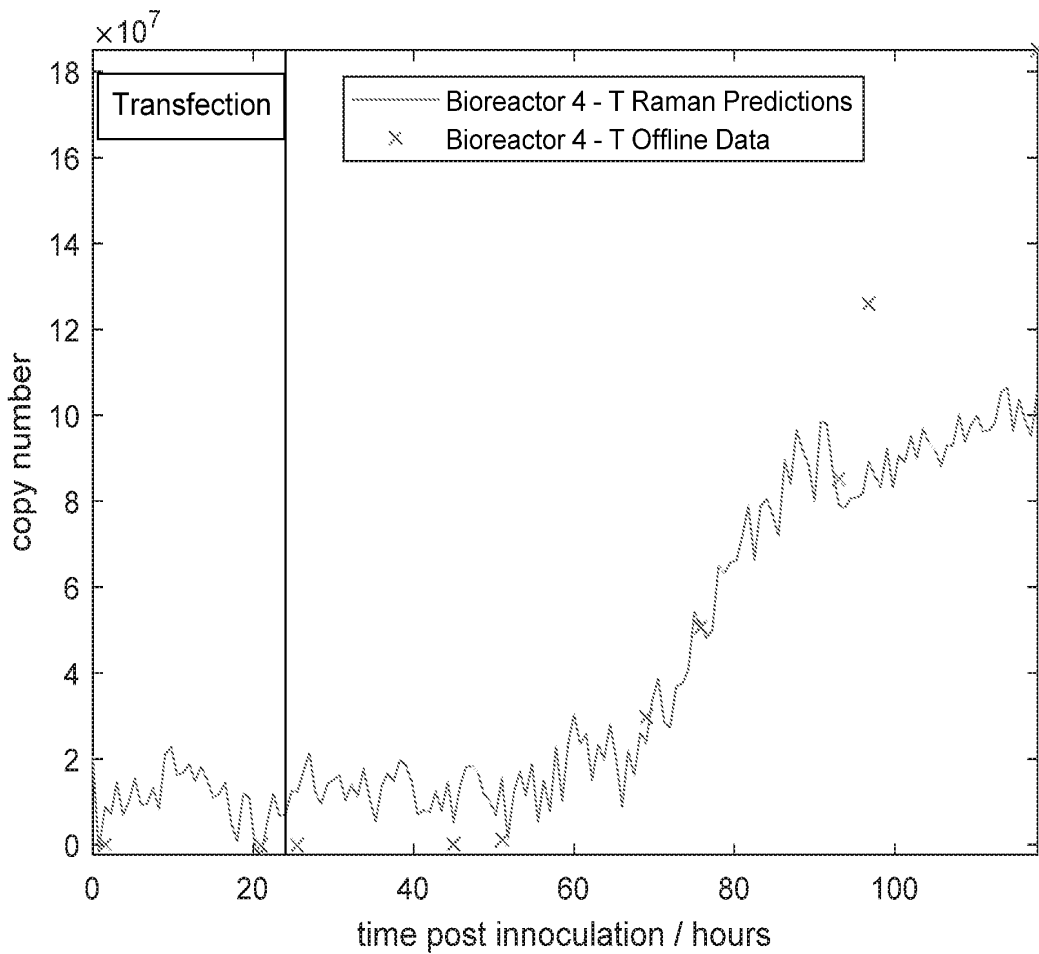


Figure 8

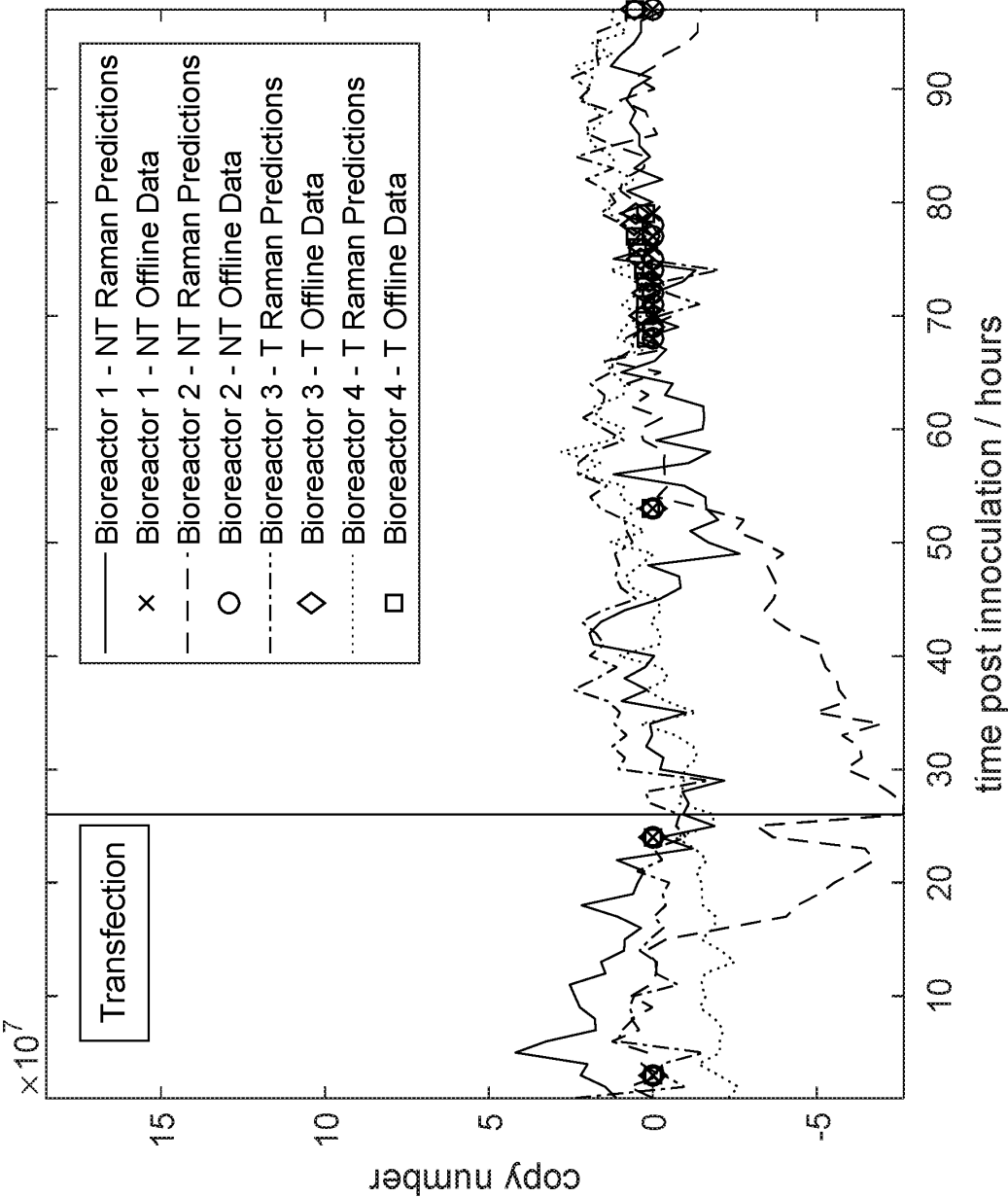


Figure 9

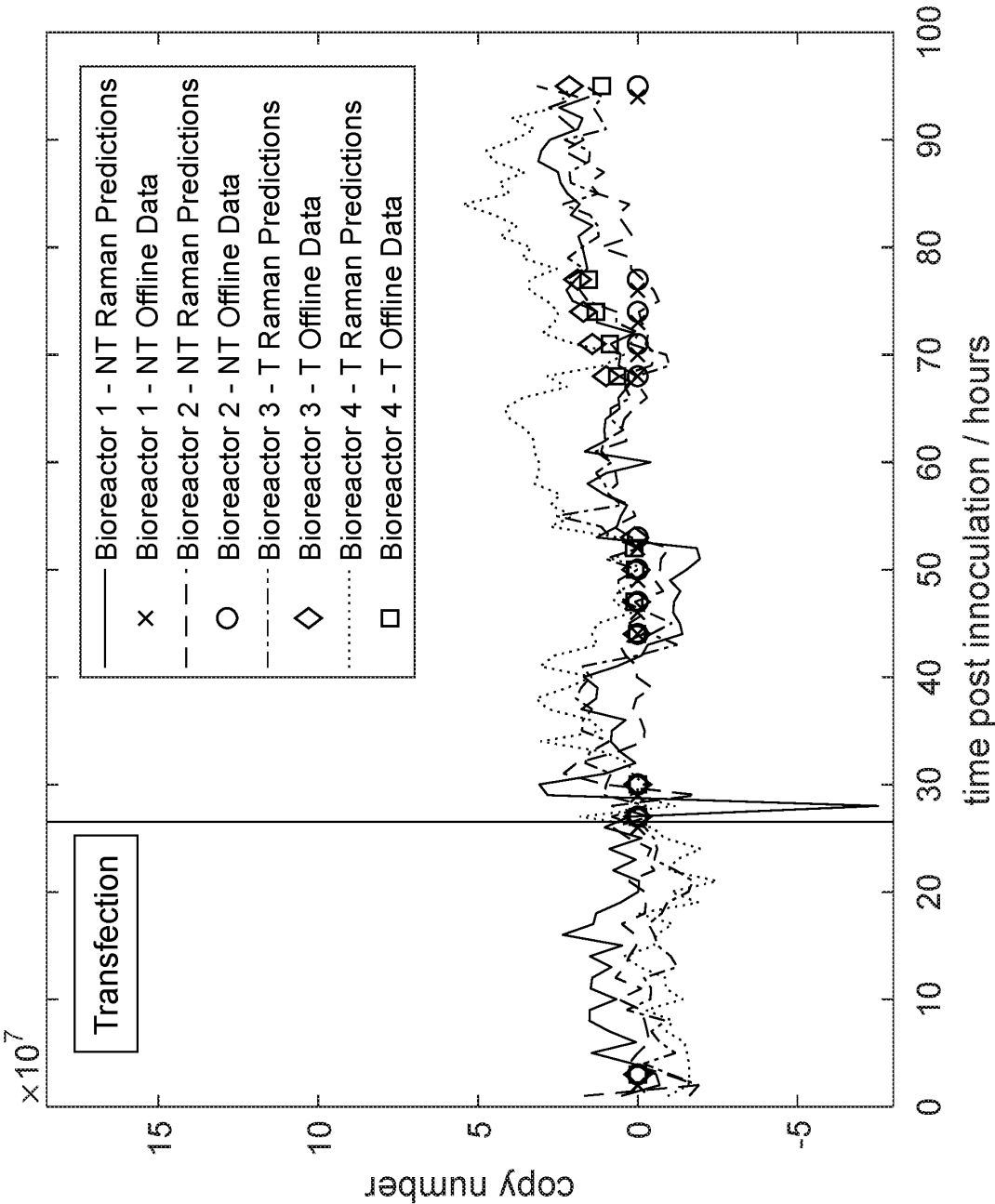


Figure 10

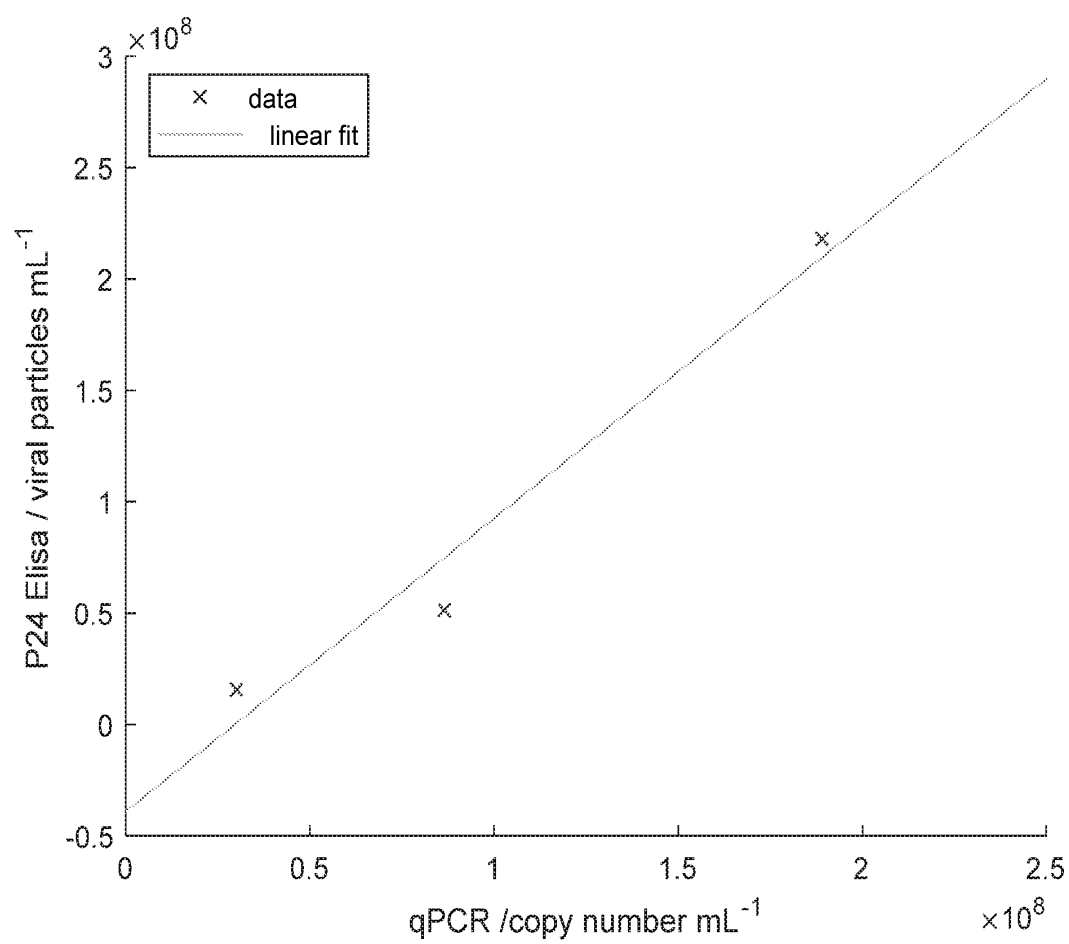


Figure 11

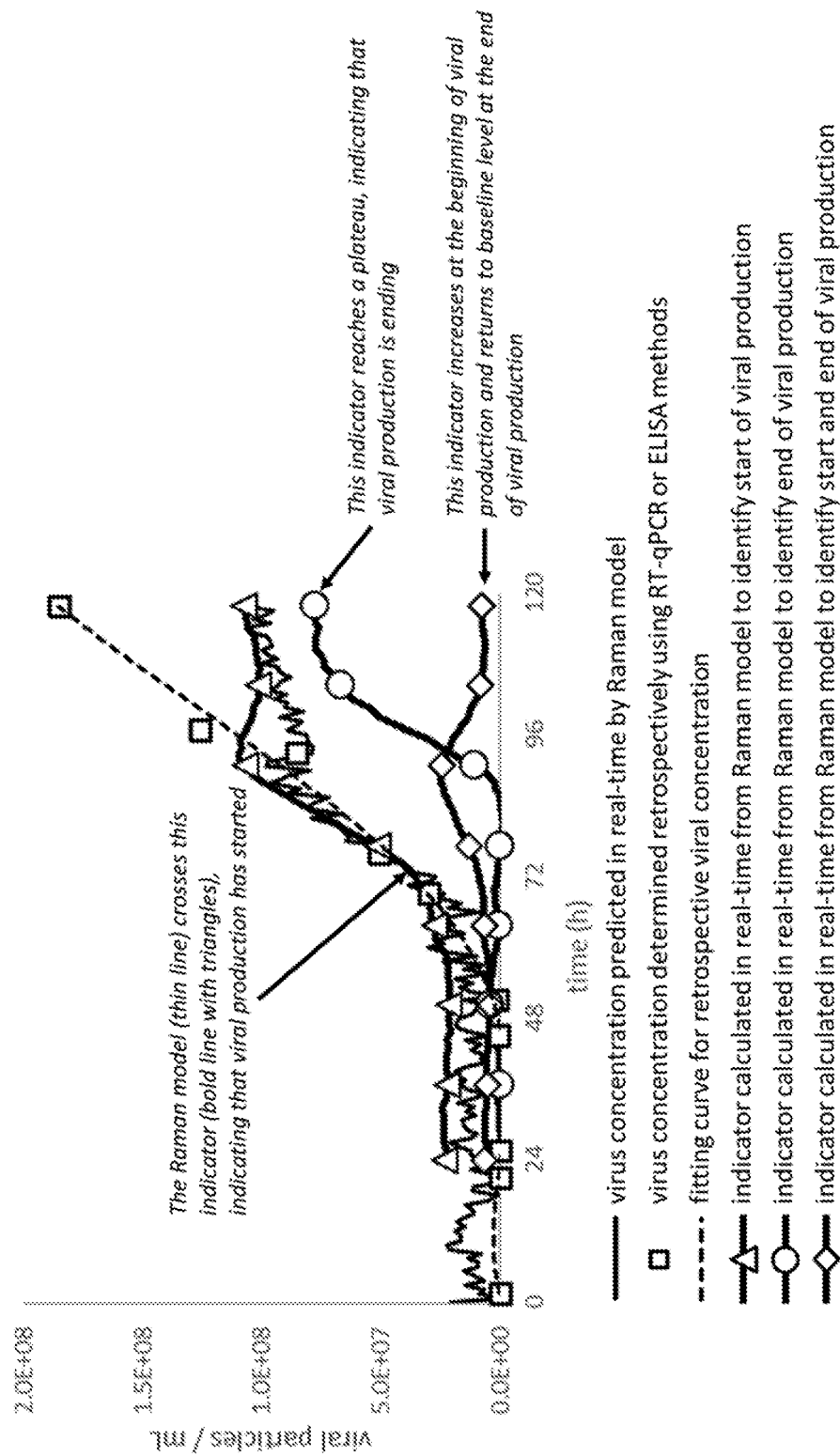


Figure 12

Regression Coefficients (β)
β_1
β_2
β_3
...
β_n

Wavenumber	W_1	W_2	W_3	...	W_n
Raman Spectrum Intensity	A_1	A_2	A_3	...	A_n

$$Titer\ Prediction = (A_1 \times \beta_1) + (A_2 \times \beta_2) + (A_3 \times \beta_3) + \dots (A_n \times \beta_n)$$

Figure 13

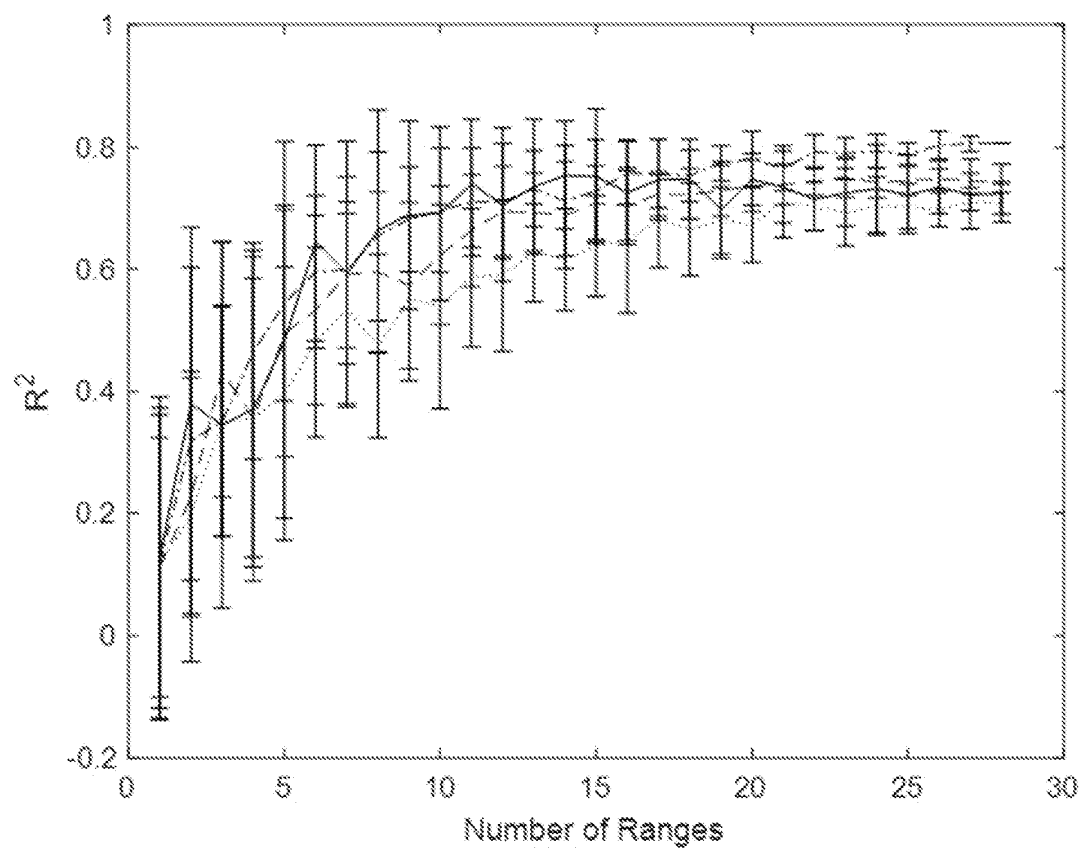


Figure 14

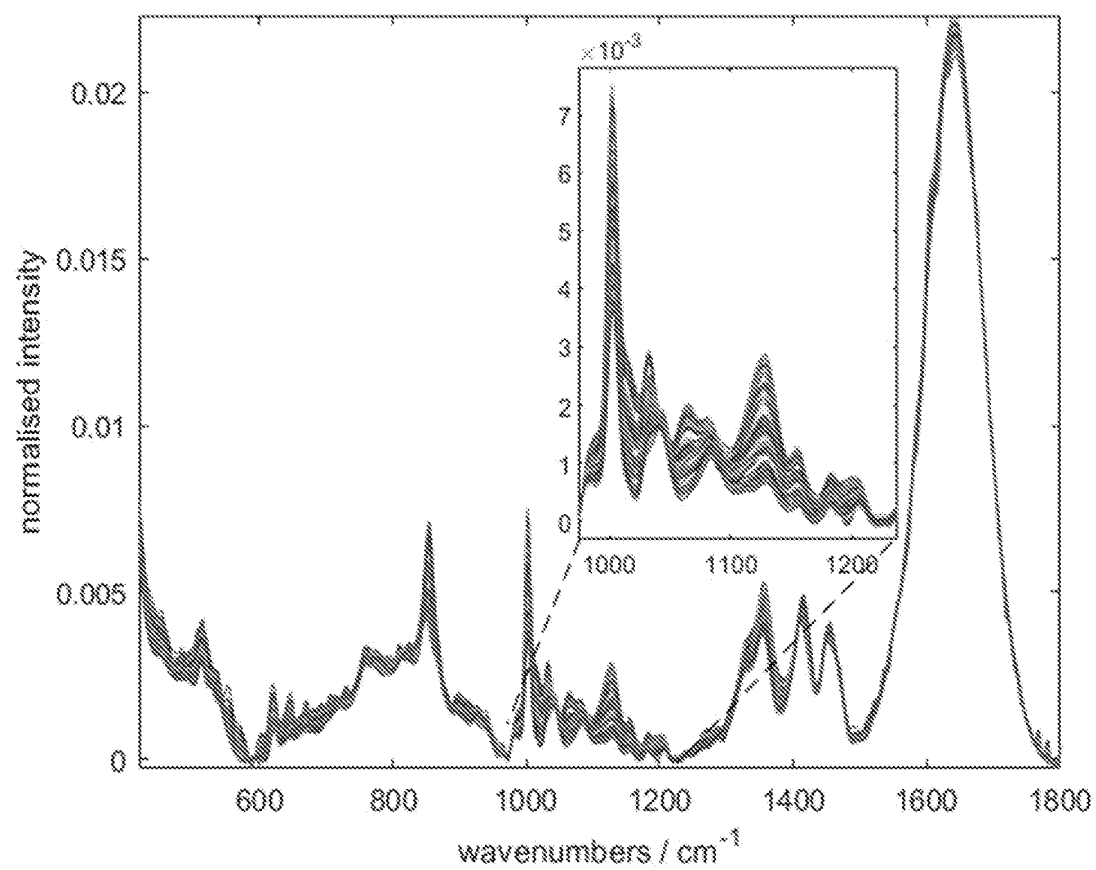


Figure 15

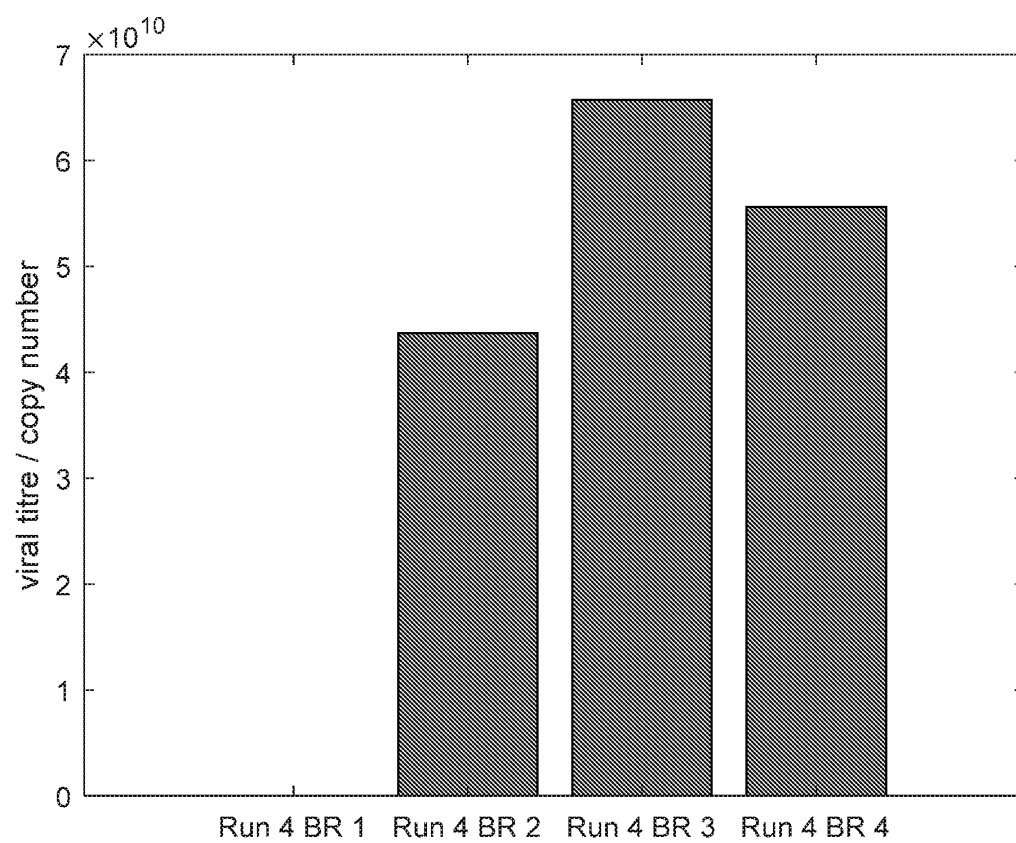


Figure 16

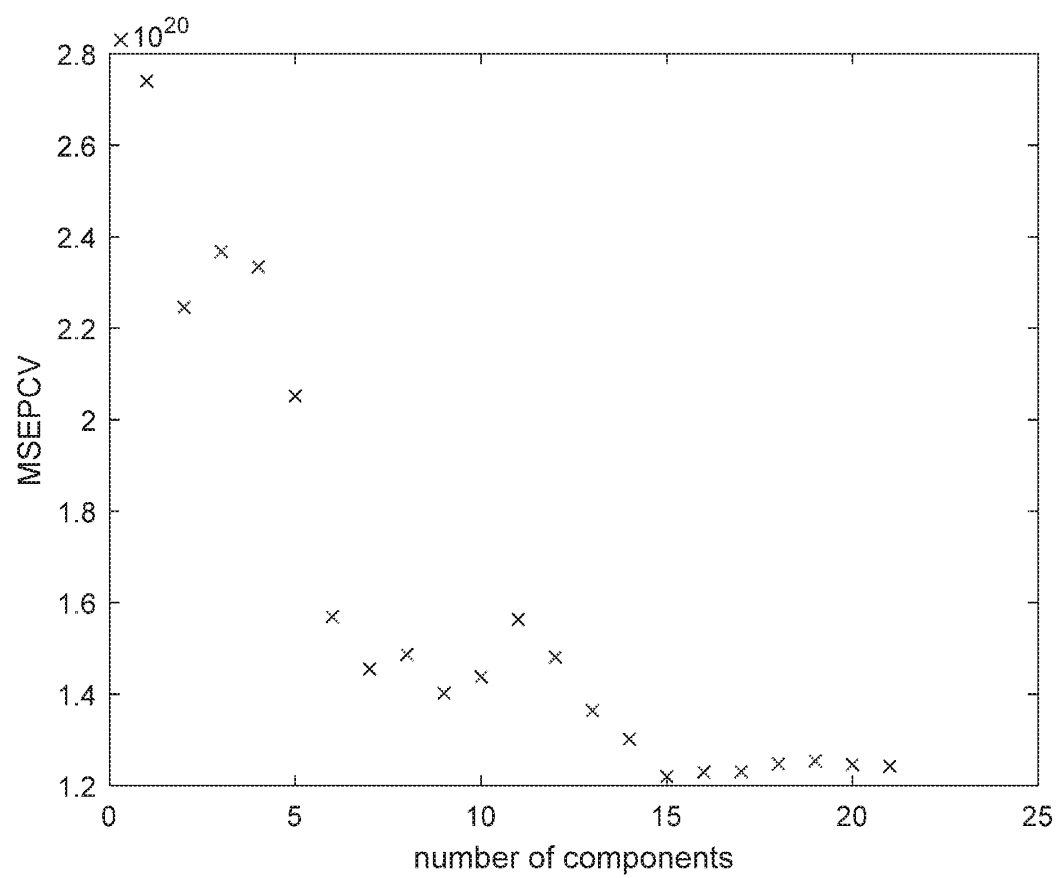


Figure 17A

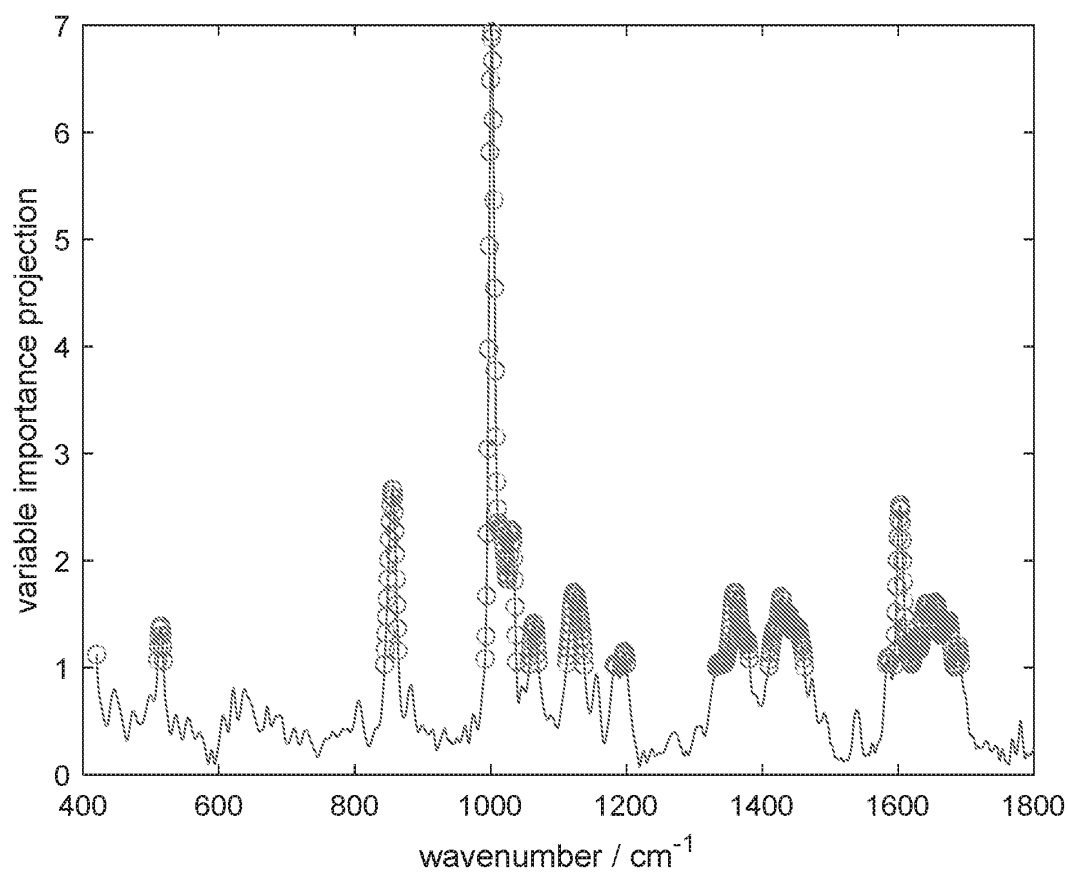


Figure 17B

Variable Ranges / cm^{-1}
420
510-517
844-863
992-1037
1057-1069
1112-1137
1182-1184
1193-1199
1333-1380
1410-1461
1583-1586
1594-1692

Figure 17C

<u>Wavenumber Range</u> <u>/cm-1</u>	<u>Peak</u> <u>VIP</u>	<u>Integrated VIP</u>	<u>Integrated VIP as %</u> <u>of Total Integrated</u> <u>VIP</u>
1594-1692	2.5216	138.2853	26.80
992-1037	6.9381	133.8646	25.94
1410-1461	1.6650	70.7048	13.70
1333-1380	1.7030	60.6275	11.75
844-863	2.6652	38.4608	7.45
1112-1137	1.7035	36.5806	7.09
1057-1069	1.4161	15.3906	2.98
510-517	1.3884	9.0333	1.75
1193-1199	1.1516	6.6665	1.29
1583-1586	1.0933	3.2301	0.63
1182-1184	1.0359	2.0611	0.40
420	1.1229	1.1229	0.22

Figure 18

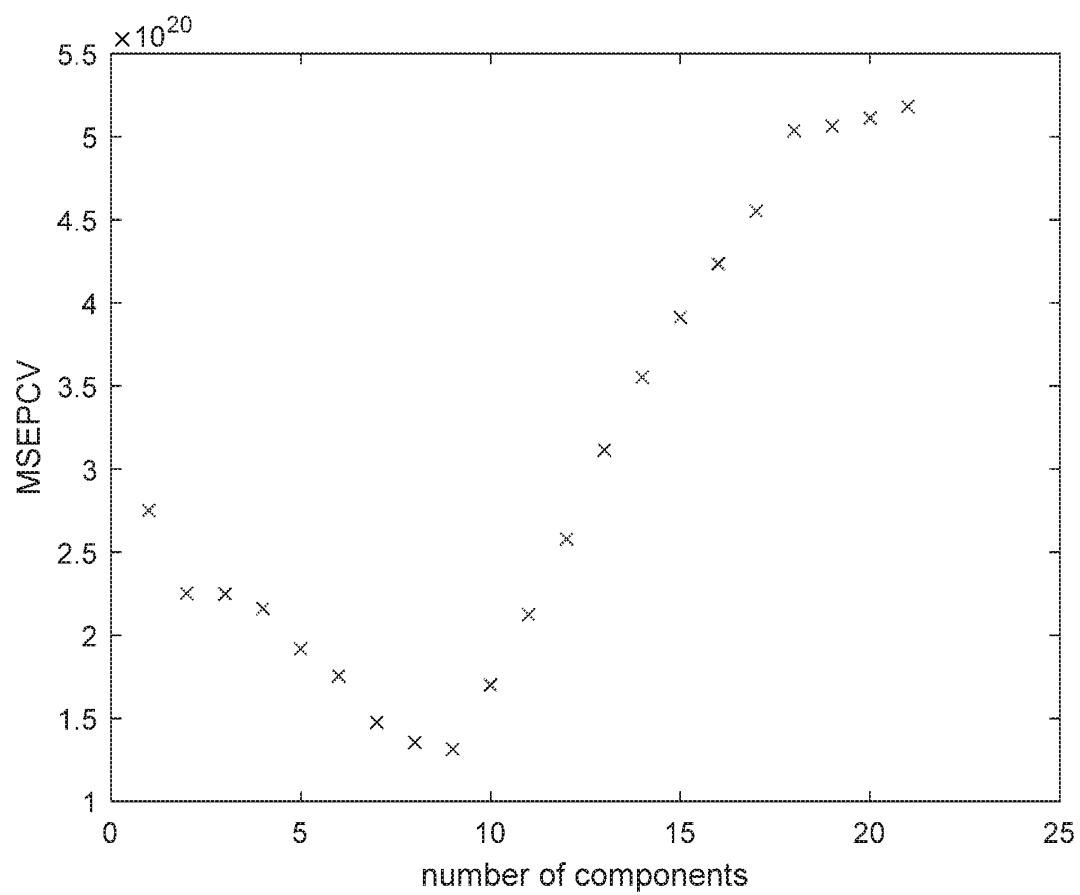


Figure 19

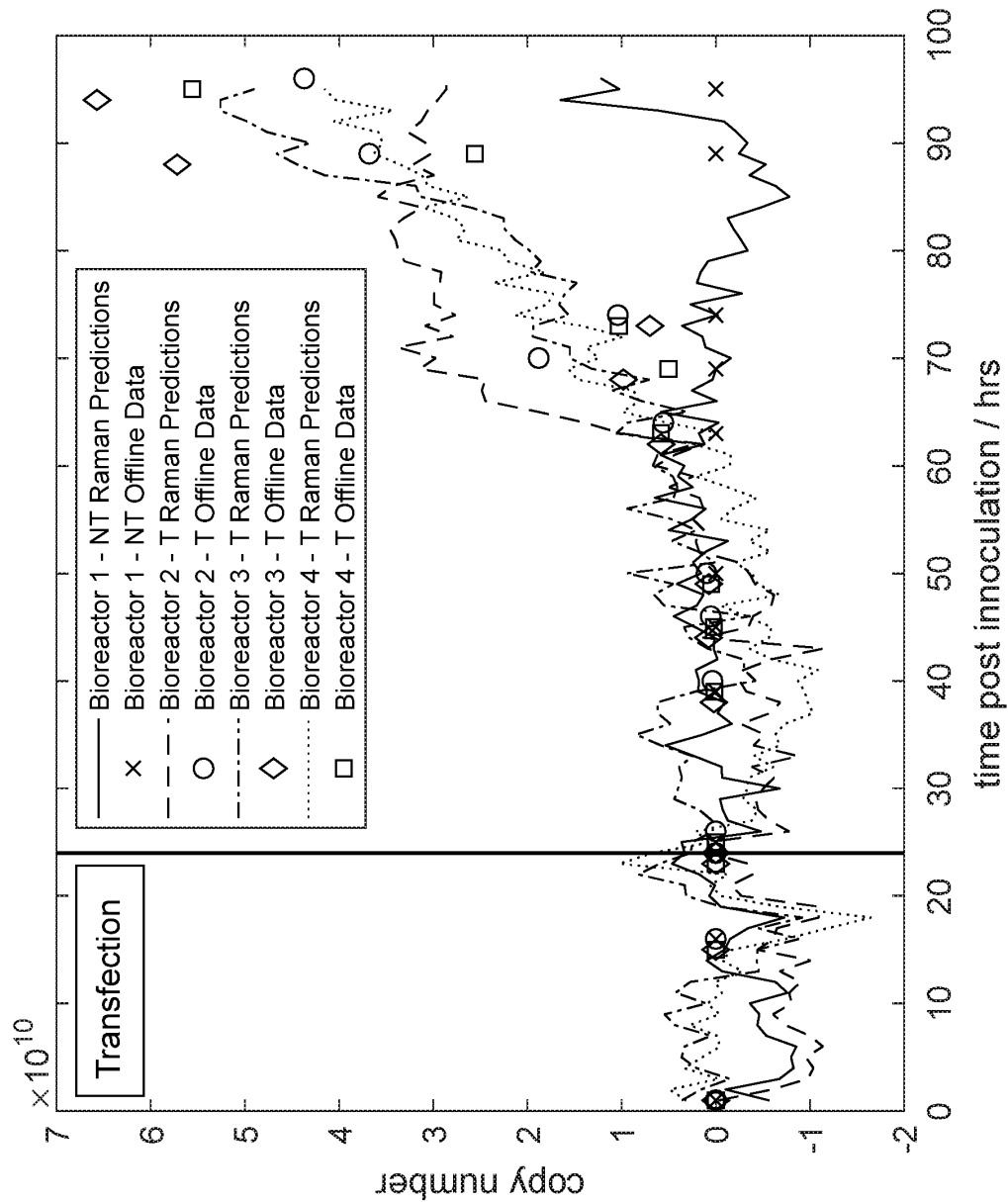


Figure 20

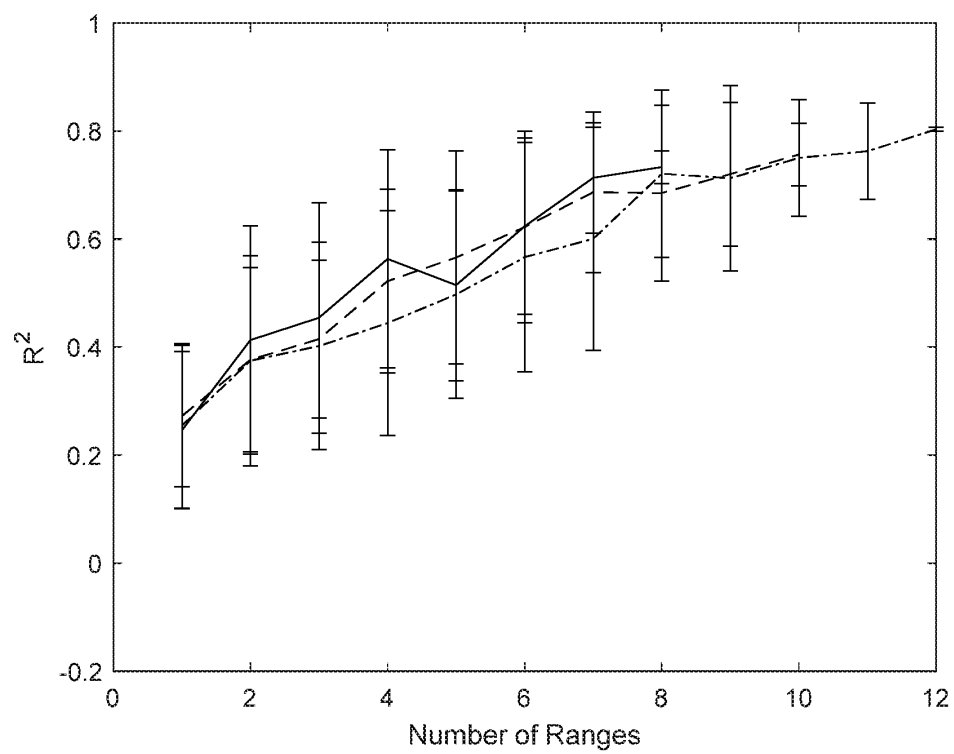


Figure 21

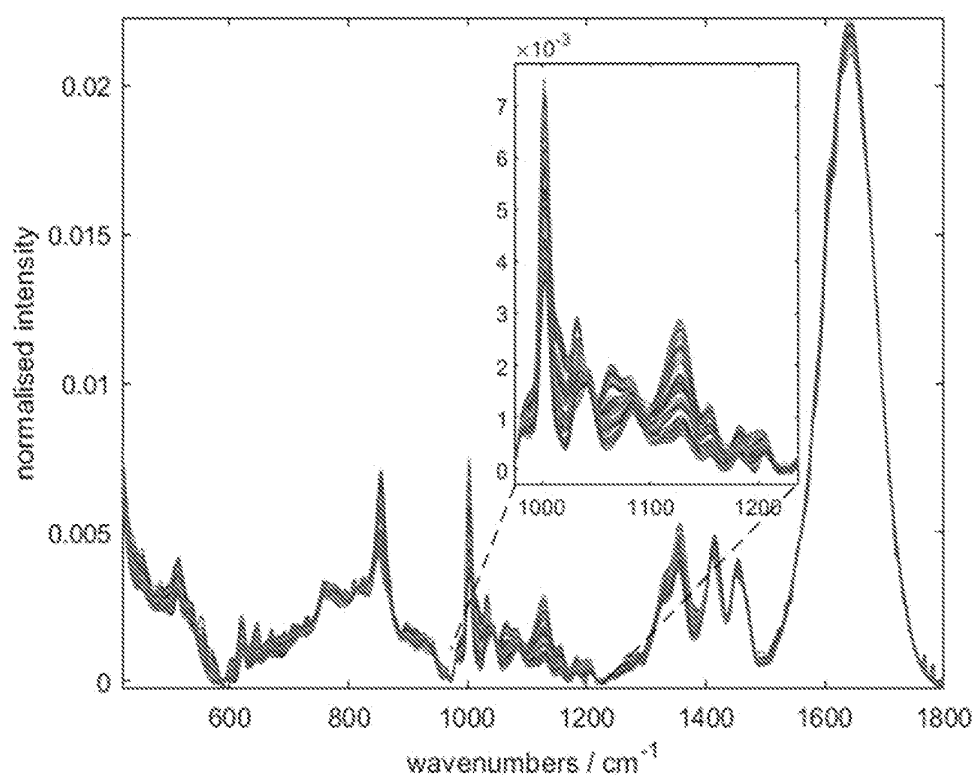


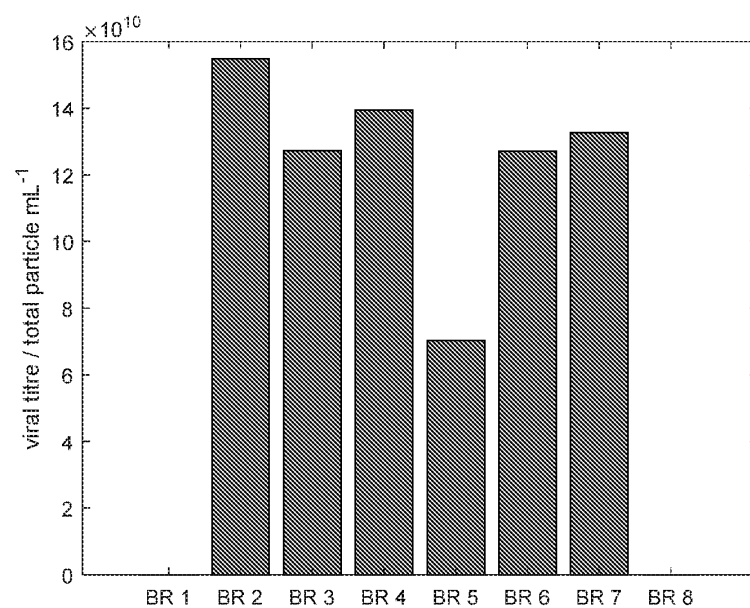
Figure 22

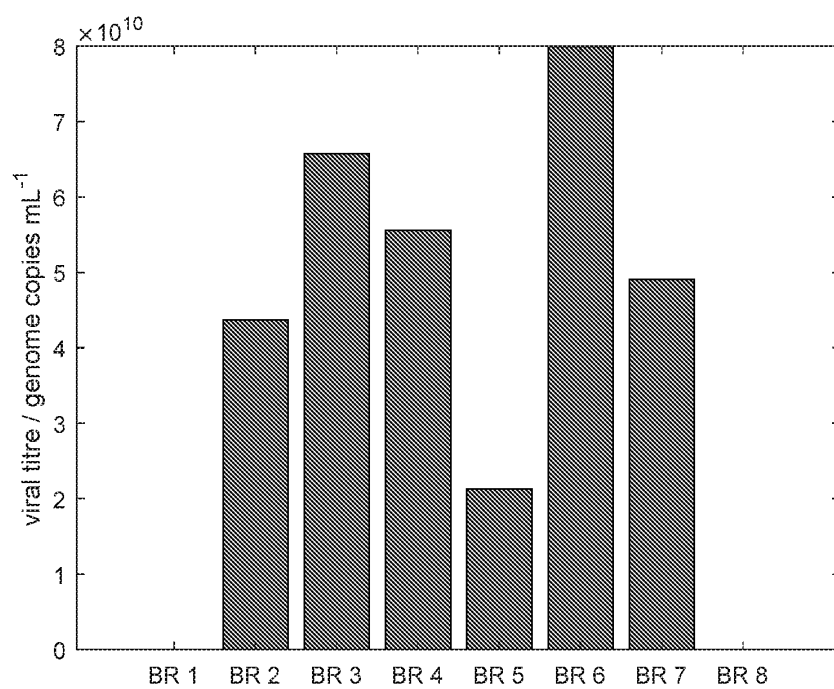
Figure 23

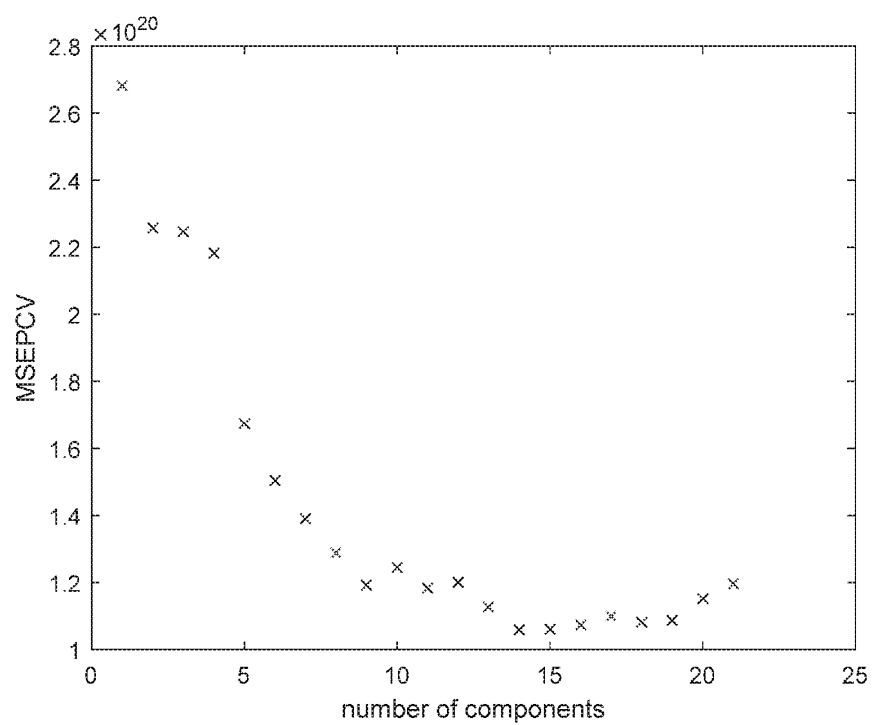
Figure 24

Figure 25

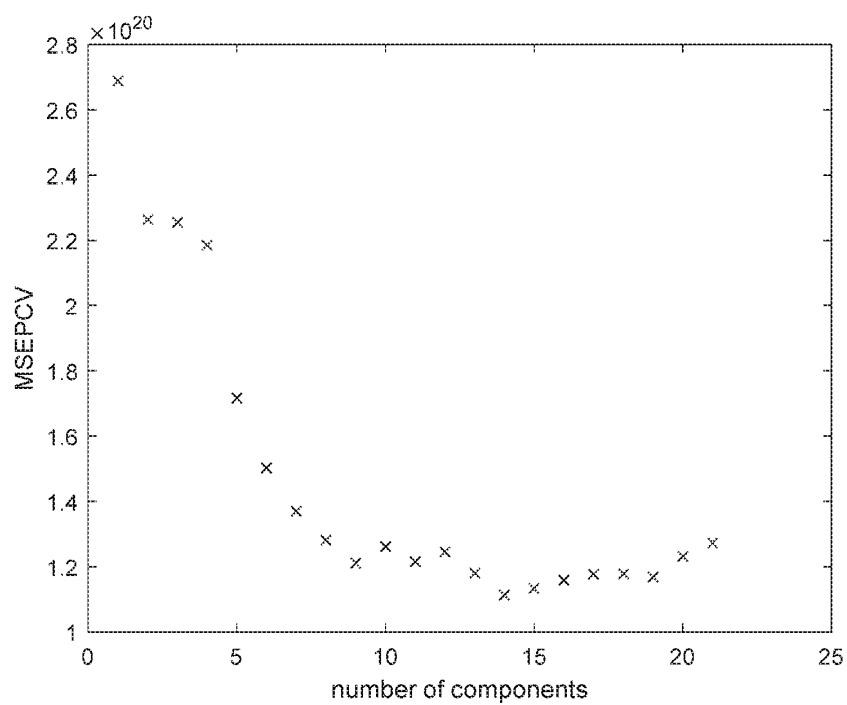


Figure 26

A

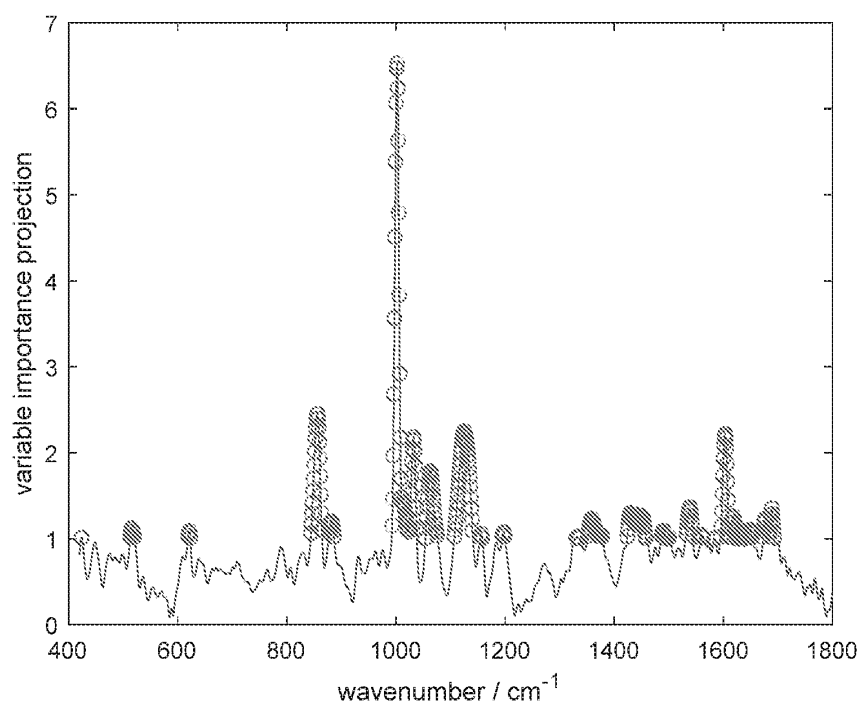


Figure 26
B

Variable Ranges / cm⁻¹
423
513-519
619-6223
844-863
877-885
993-1037
1054-1074
1107-1139
1154-1157
1195-1198
1330-1335
1352-1377
1424-1457
1487-1493
1496-1500
1532-1543
1559-1562
1583
1595-1610
1614-1622
1626-1634
1646-1651
1673-1678
1684-1693

Figure 26
C

<u>Wavenumber Range /cm-1</u>	<u>Peak VIP</u>	<u>Integrated VIP</u>	<u>Integrated VIP as % of Total Integrated VIP</u>
993-1037	6.5282	107.9935	25.4655
1107-1139	2.2502	57.6637	13.5975
1424-1457	1.2990	40.0296	9.4392
844-863	2.4516	35.9060	8.4669
1054-1074	1.7864	29.1864	6.8823
1352-1377	1.2330	27.7755	6.5496
1595-1610	2.2190	25.6717	6.0535
1532-1543	1.3651	13.8427	3.2642
1684-1693	1.3534	10.8253	2.5527
1614-1622	1.2634	9.4275	2.2231
877-885	1.2026	9.2663	2.1850
1626-1634	1.0945	8.4667	1.9965
513-519	1.1255	6.5514	1.5449
1487-1493	1.0950	6.4289	1.5160
1673-1678	1.2333	5.8411	1.3774
1646-1651	1.1042	5.3947	1.2721
1330-1335	1.0255	5.0958	1.2016
1496-1500	1.0188	4.0542	0.9560
619-6223	1.0892	3.2173	0.7587
1195-1198	1.0766	3.1871	0.7515
1154-1157	1.0585	3.1354	0.7394
1559-1562	1.0462	3.1098	0.7333
423	1.0063	1.0063	0.2373
1583	1.0002	1.0002	0.2358

Figure 27

A

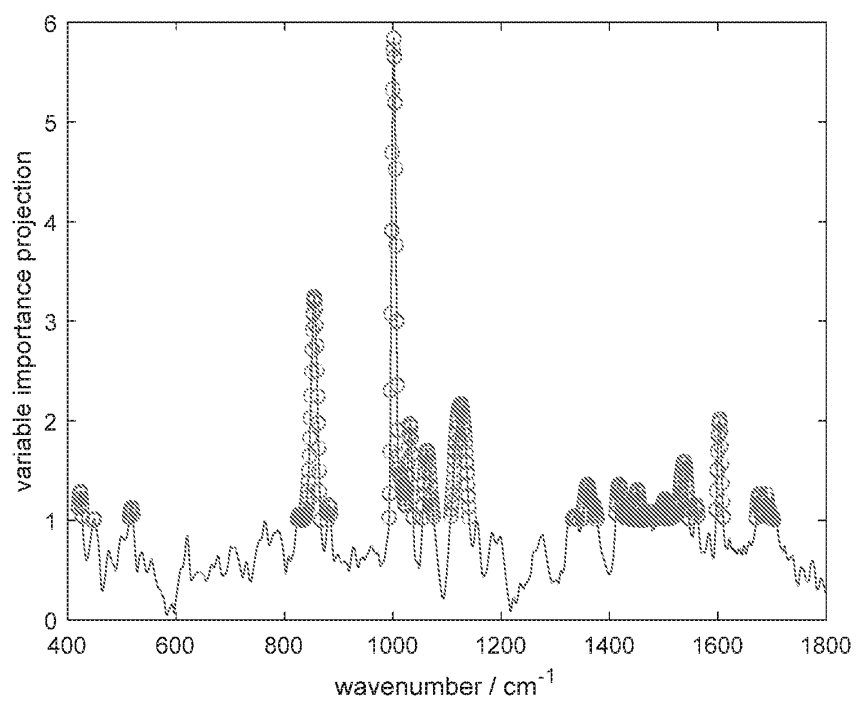


Figure 27
B

Variable Ranges / cm⁻¹
420-426
447-448
541-519
824-833
838-866
879-884
933-1037
1055-1074
1107-1140
1332-1338
1350-1376
1412-1429
1438-1441
1445-1464
1471-1475
1486-1506
1513-1546
1558-1562
1597-1609
1671-1703

Figure 27

C

<u>Wavenumber Range /cm-1</u>	<u>Peak VIP</u>	<u>Integrated VIP</u>	<u>Integrated VIP as % of Total Integrated VIP</u>
933-1037	5.8401	101.7239	20.9756
838-866	3.2433	58.5054	12.0639
1107-1140	2.1703	57.9222	11.9436
1513-1546	1.5896	42.063	8.6734
1671-1703	1.2635	35.7815	7.3782
1350-1376	1.3605	31.1909	6.4316
1055-1074	1.6992	26.8308	5.5325
1486-1506	1.2119	22.1012	4.5573
1445-1464	1.3060	21.37	4.4065
1412-1429	1.3611	20.4891	4.2249
1597-1609	2.0128	20.0685	4.1381
824-833	1.0571	9.3968	1.9376
420-426	1.2872	7.3876	1.5233
1332-1338	1.0403	6.1995	1.2783
879-884	1.1546	5.5705	1.1486
541-519	1.1249	5.4956	1.1332
1558-1562	1.1539	4.5103	0.93
1471-1475	1.0868	4.2639	0.8792
1438-1441	1.0348	3.0875	0.6366
447-448	1.0116	1.0059	0.2074

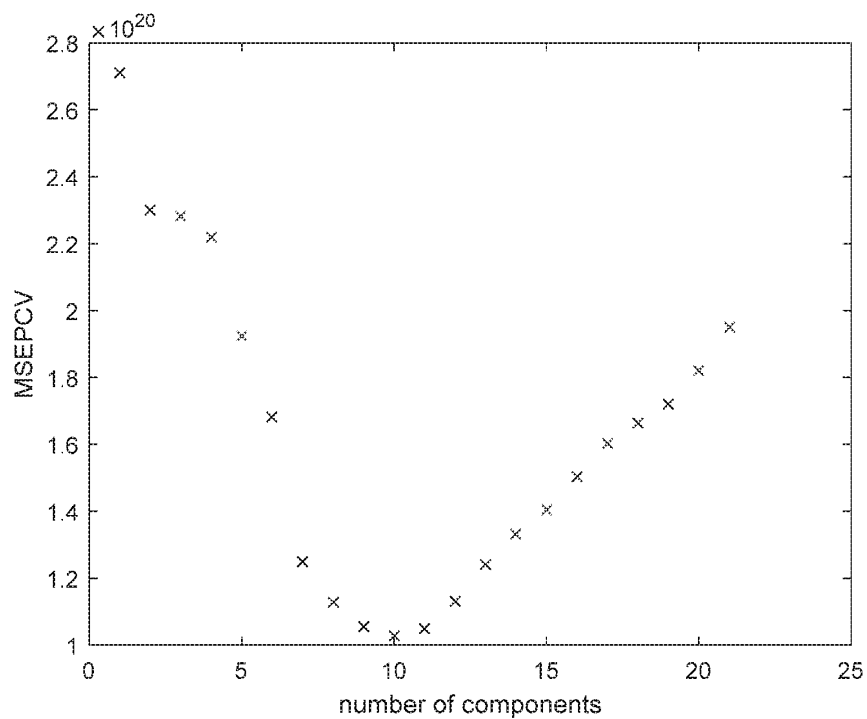
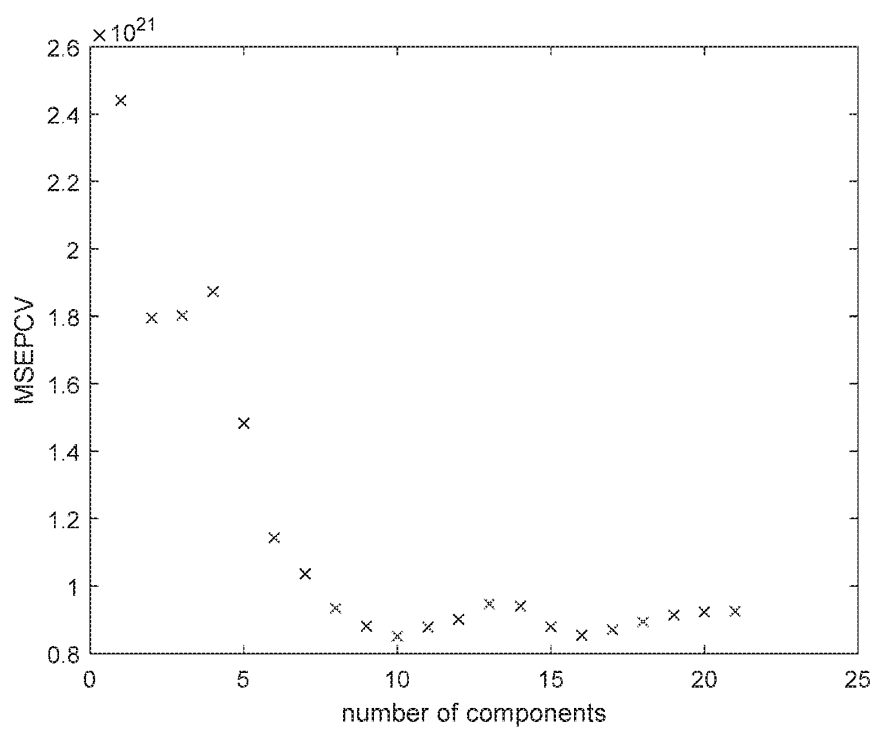
Figure 28**Figure 29**

Figure 30

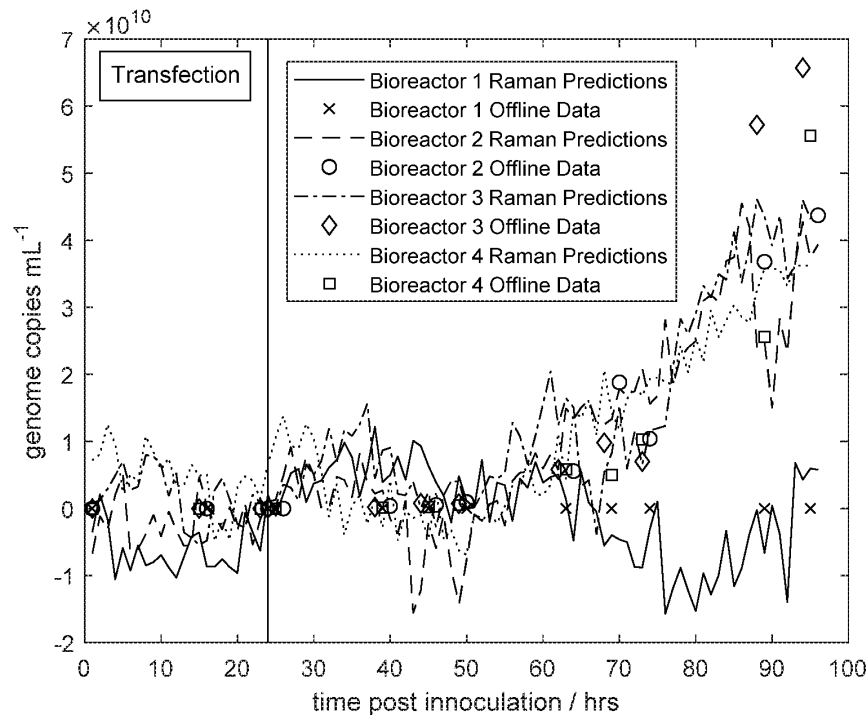


Figure 31

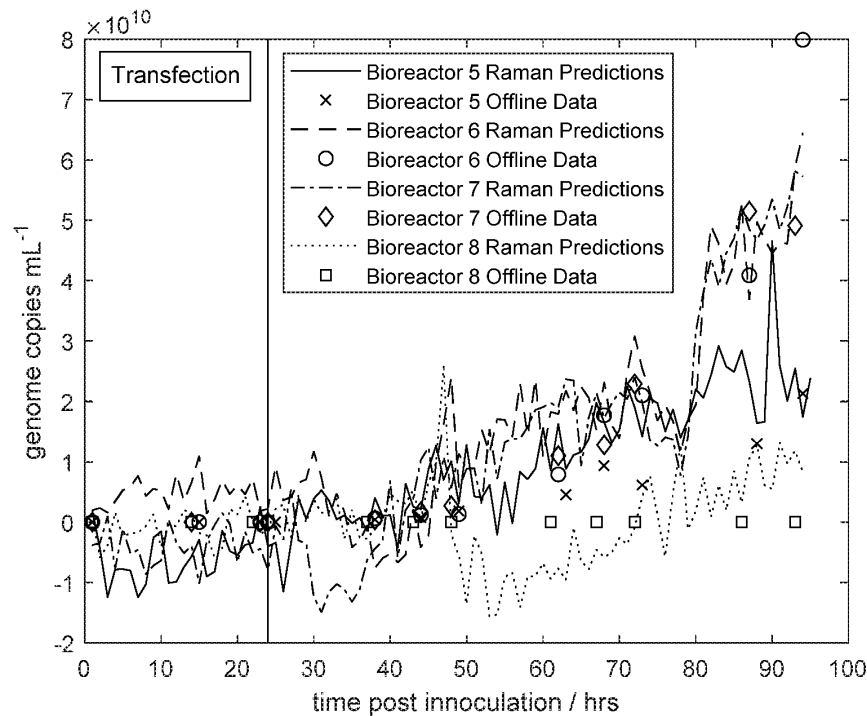


Figure 32

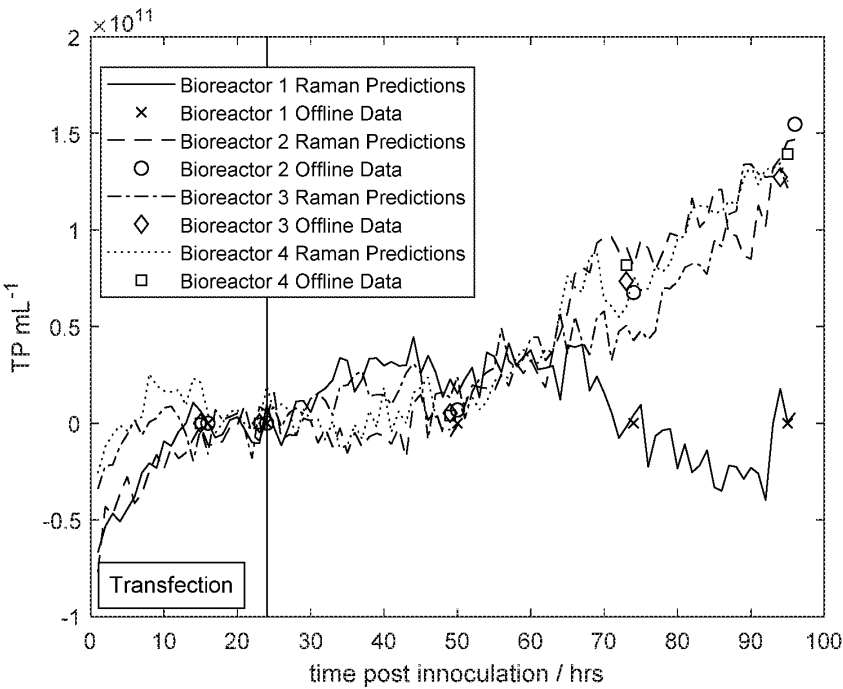


Figure 33

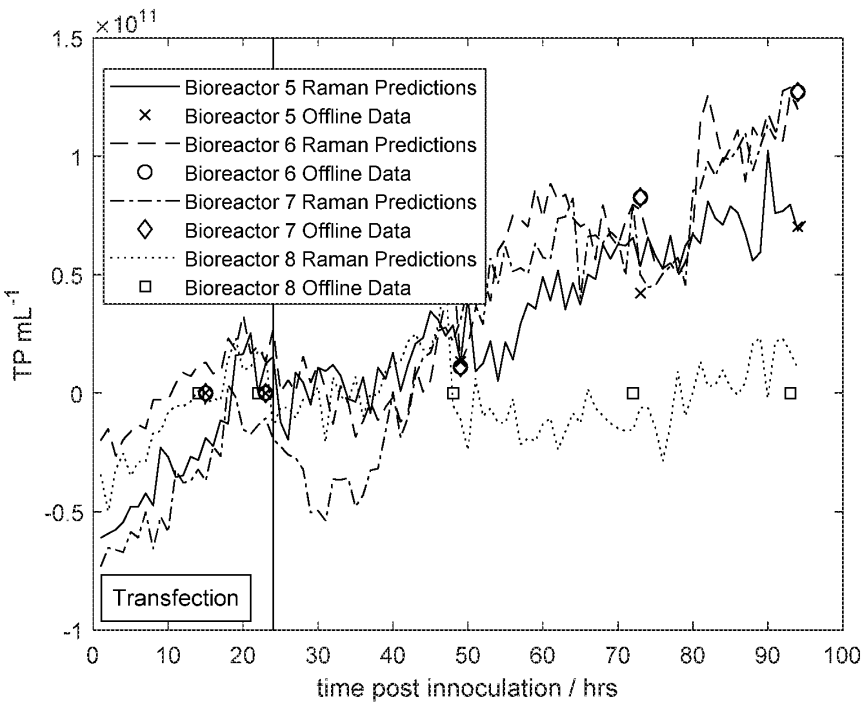


Figure 34

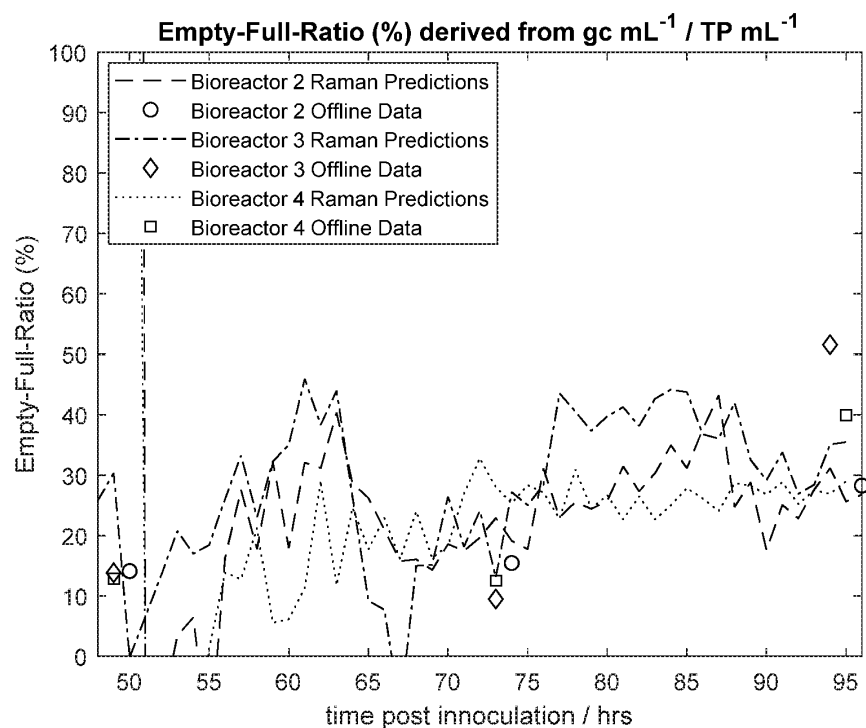


Figure 35

