Supporting Information

Synthesis and Biological Evaluation of Three New Chitosan Schiff Base Derivatives

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Table S1: shows the details for the treatment of C_1, C_2, C_3, and C_4

SAMPLE	PROCESS	TREATMENT/ DESCRIPTION
C_1		The fish scales were washed and grinded into the powder form. The powder was treated with hot ethanol (50 - 60 ^oC) to kill germs and remove pungent odour. The resulting sample (designated as C_1) was washed with ample amount of water and subjected to freeze-drying.
C_2	Demineralization	HCl (5 %) was added slowly to the powder to remove $CaCO_3$ component with volume to sample ratio 5:1. The reaction mixture was stirred for 3 hrs. After that, the powder was washed with ample amount of water until pH is neutral; 10g of samples is collected and labelled as C_2.
C_3	Deproteinization	NaOH (10 %) was added to denature the powder and remove the protein at 60 $^\circ C$ with volume to sample ratio 5:1. The mixture was stirred for 3 hours. After that, the powder was washed with ample amount of water until pH is neutral; 10g of samples is collected and labelled as C_3.
C_4	Deacetylation	NaOH (50 %) was added to deacetylate the chitin into chitosan with volume to sample ratio 5:1. The mixture was treated under reflux condition for 3 hours. After that, the powder was washed with ample amount of water until pH is neutral; 10g of samples is collected and labelled as C_4.

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Table S2: illustrate the characteristic by the Acid-base titration method of standard and experimentally prepared chitosan

Sample	W	C_1 / M	V_1 / mL	C_2 / M	V_2/ mL	(-NH_2)	DD%
C_4	0.2909	0.1	30.00	0.1	19.6	0.0555	65.50
Chitin	0.3001	0.1	30.00	0.1	29.8	0.0011	2.09
Chitosan	0.2998	0.1	30.00	0.1	12.2	0.0949	96.10

Table S3: shows the characteristic absorption bands in the FT-IR spectra of standard and experimentally prepared chitosan

Wavenumber / cm^{-1}				Vibration Mode
Chitin		Chitosan		
Chitin	C3	Chitosan	C_4	
3441	3446	3437	3441	$\nu(NH_2)$ assoc. in primary amines ν(OH) assoc. in pyranose ring
3112	3107	2874	2958	$\nu_{as}(CH_2)$ in CH2OH group
2891	2891	-	2887	ν(C-H) in pyranose ring
1655 (Shoulder)	1655 (Shoulder)	1602 (Shoulder)	1627 (Shoulder)	ν(C=O) in $NHCOCH_3$ group (Amide I band)
1416	1419	1421	1414	$\delta(CH_2)$ in the CH_2OH group
1382	1382	1383	1383	$\delta_s(CH_3)$ in $NHCOCH_3$ group
1316	1316	1324	1316	δ(C-H) in pyranose ring
1264	1261	1259	1261	Complex vibrations of NHCO group (Amide III band)
1157	1157	1156	1157	ν_{as}(C-O-C) (glycosidic linkage)
1074	1075	1078	1075	ν_{as}(C-O-C) (glycosidic linkage)
1026	1024	1029	1024	ν(C-O) in secondary OH group
953	953	-	954	ν(C-O) in primary OH group
896	896	895	896	Pyranose ring skeletal vibrations
695	596	663	617	δ(NH) out of plane
598	527	578	529	δ(OH) out of a plane

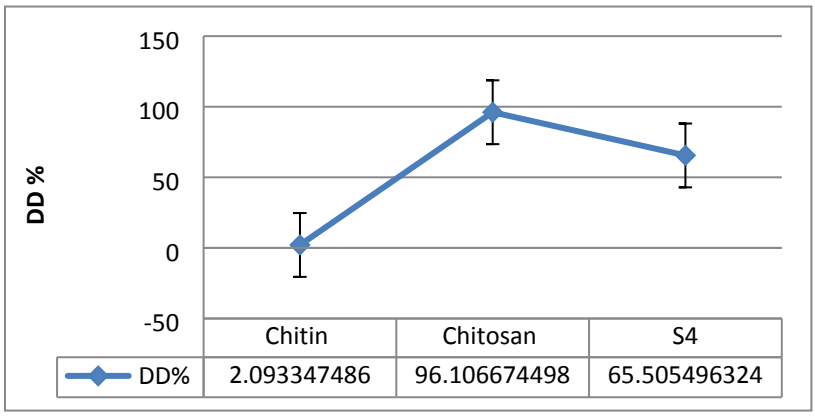


Figure S1: DD % of S_4, chitin and chitosan samples

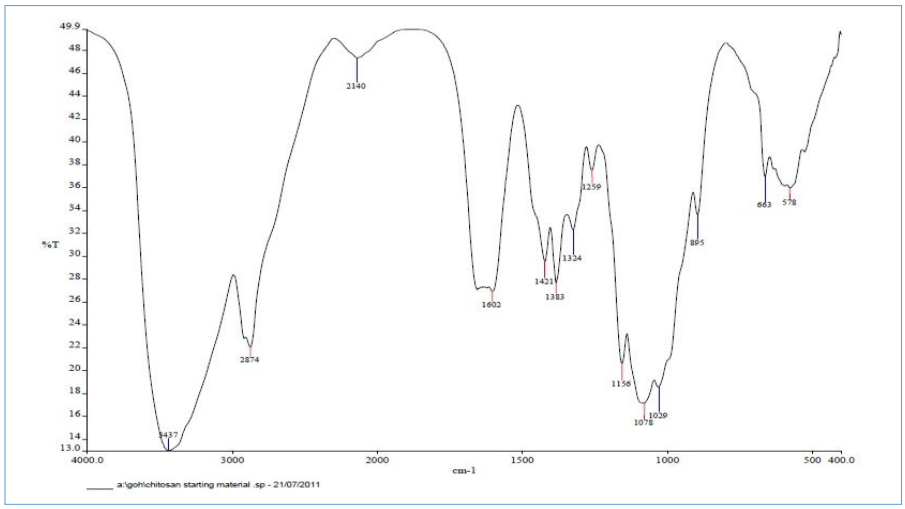


Figure S2: FT-IR spectrum of CS (Amrec Sirim; DD %=96.10 %)

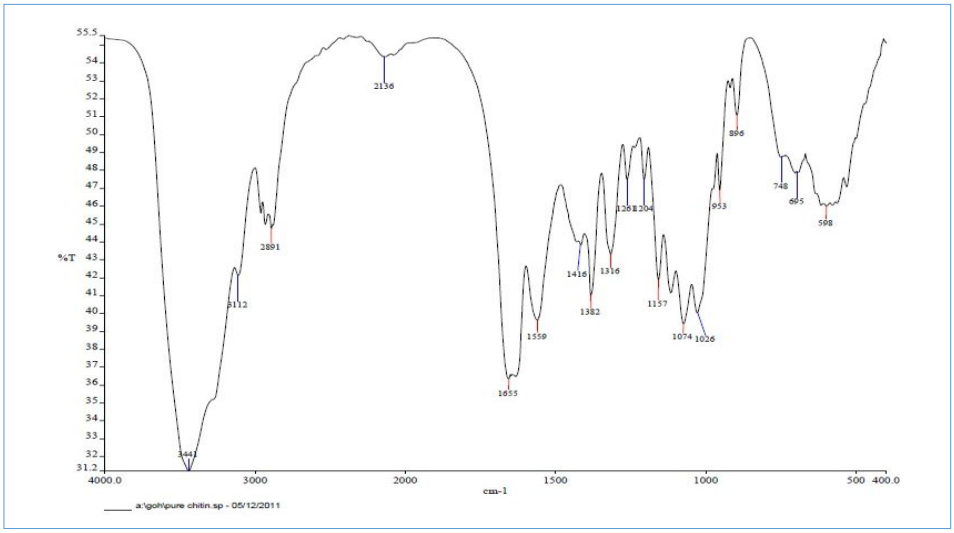


Figure S3: FT-IR spectrum of CH (Himedia; DD % =2.09%)

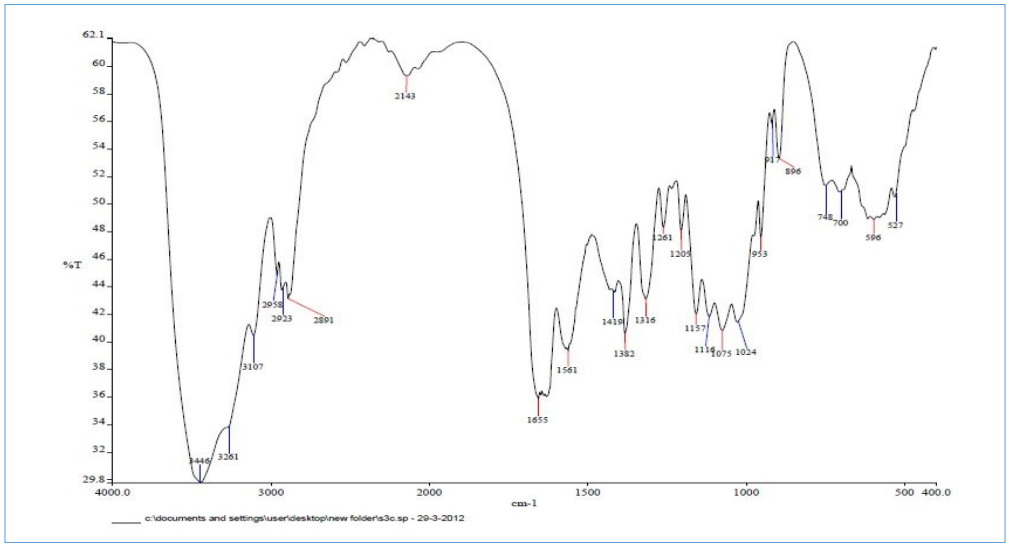


Figure S4: Shows the FT-IR spectrum of C_3

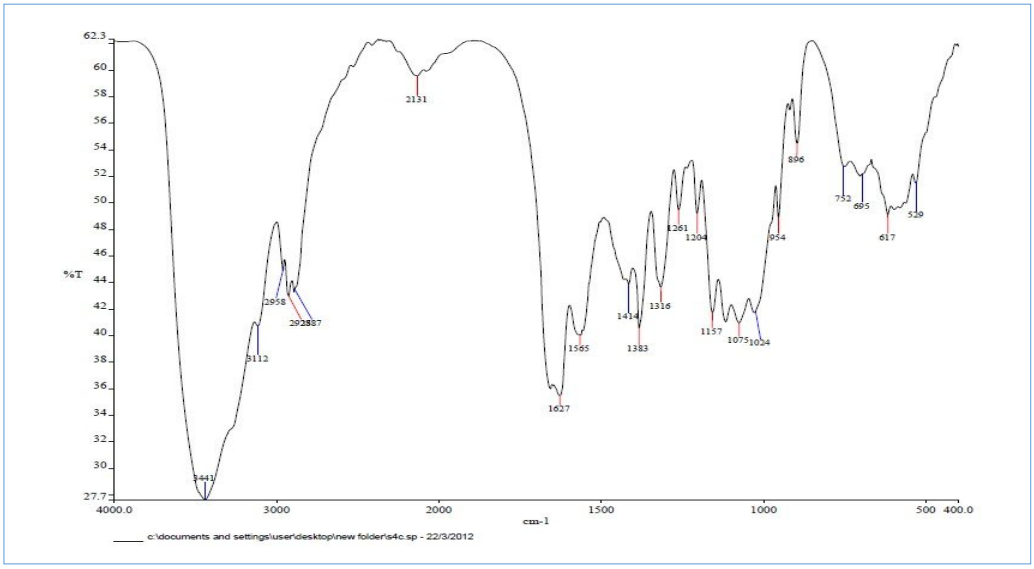


Figure S5: FT-IR spectrum of C_4 (DD %=65.50 %)

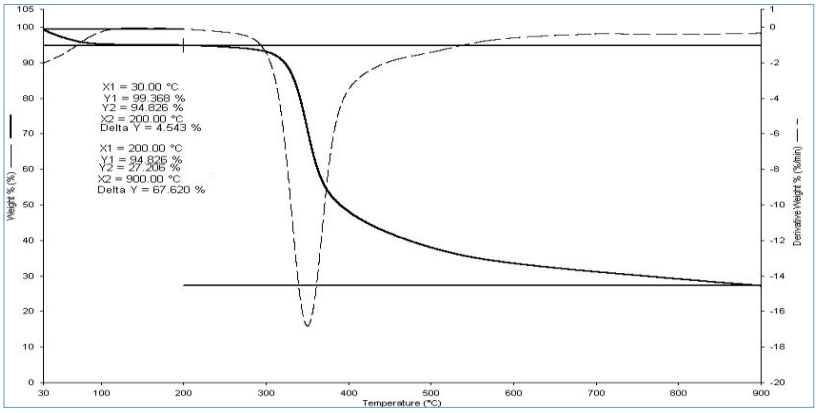


Figure S6: TG and DTG plots of CS (Amrec Sirim; DD %=96.10 %)

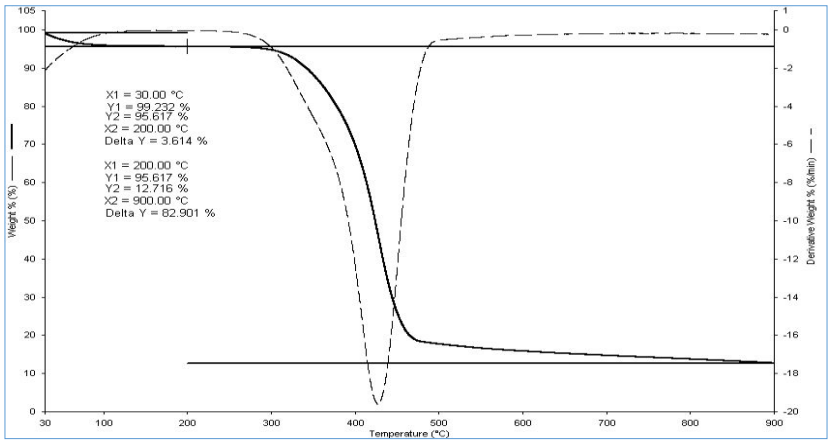


Figure S7: TG and DTG plots of CH (HiMedia; DD % =2.09%)

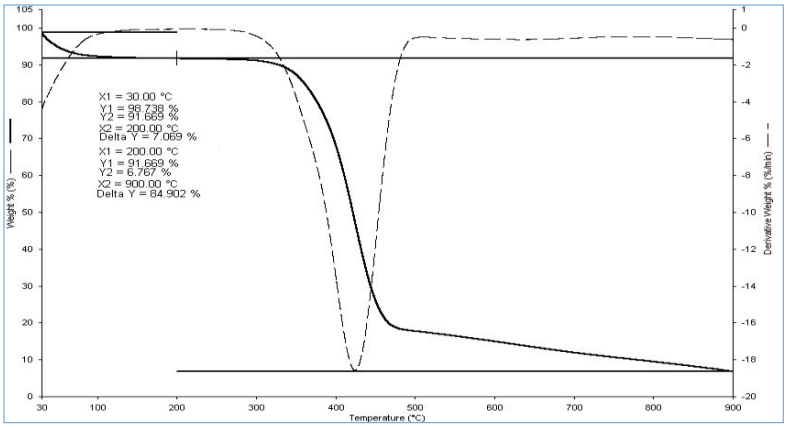


Figure S8: TG and DTG plots of C_3

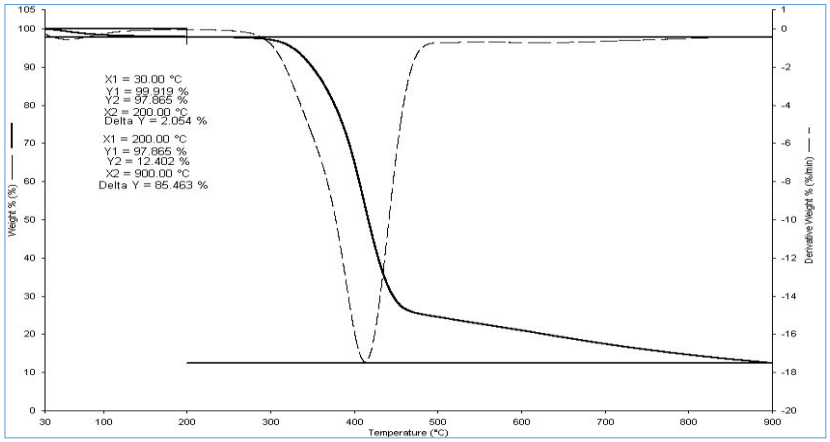
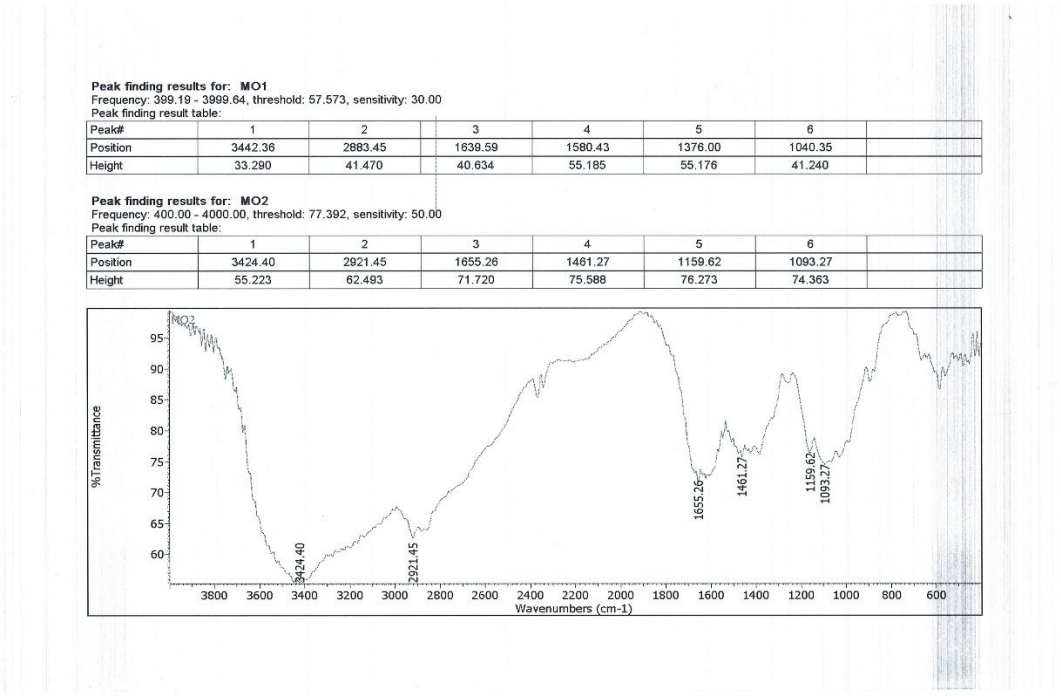


Figure S9: TG and DTG plots of C_4 (DD %=65.50 %)



Peak finding results for: MO1
Frequency: 399.19 - 3999.64, threshold: 57.573, sensitivity: 30.00
Peak finding result table:

Peak#	1	2	3	4	5	6
Position	3442.36	2883.45	1639.59	1580.43	1376.00	1040.35
Height	33.290	41.470	40.634	55.185	55.176	41.240

Peak finding results for: MO2
Frequency: 400.00 - 4000.00, threshold: 77.392, sensitivity: 50.00
Peak finding result table:

Peak#	1	2	3	4	5	6
Position	3424.40	2921.45	1655.26	1461.27	1159.62	1093.27
Height	55.223	62.493	71.720	75.588	76.273	74.363

Figure S10: FT-IR spectrum of CS-P1

Peak finding results for: MO1
Frequency: 399.19 - 3999.64, threshold: 57.573, sensitivity: 30.00
Peak finding result table:

Peak#	1	2	3	4	5	6	
Position	3442.36	2883.45	1639.59	1580.43	1376.00	1040.35	
Height	33.290	41.470	40.634	55.185	55.176	41.240	

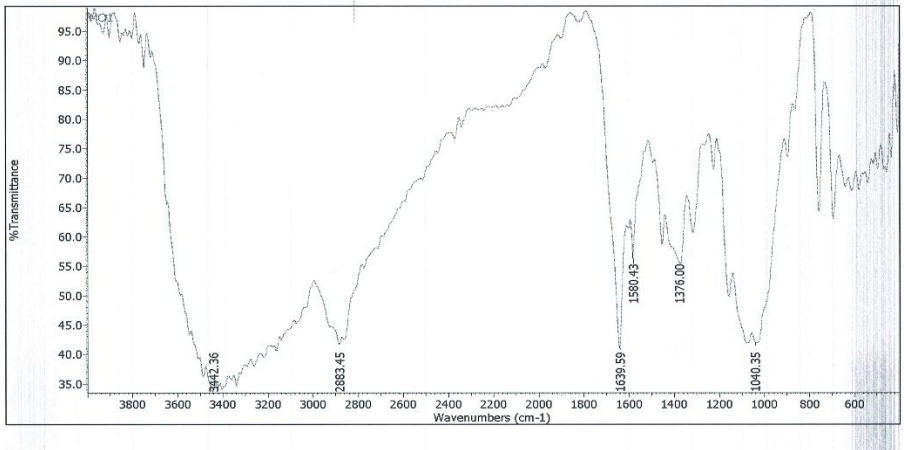


Figure S11: FT-IR spectrum of CS-P2

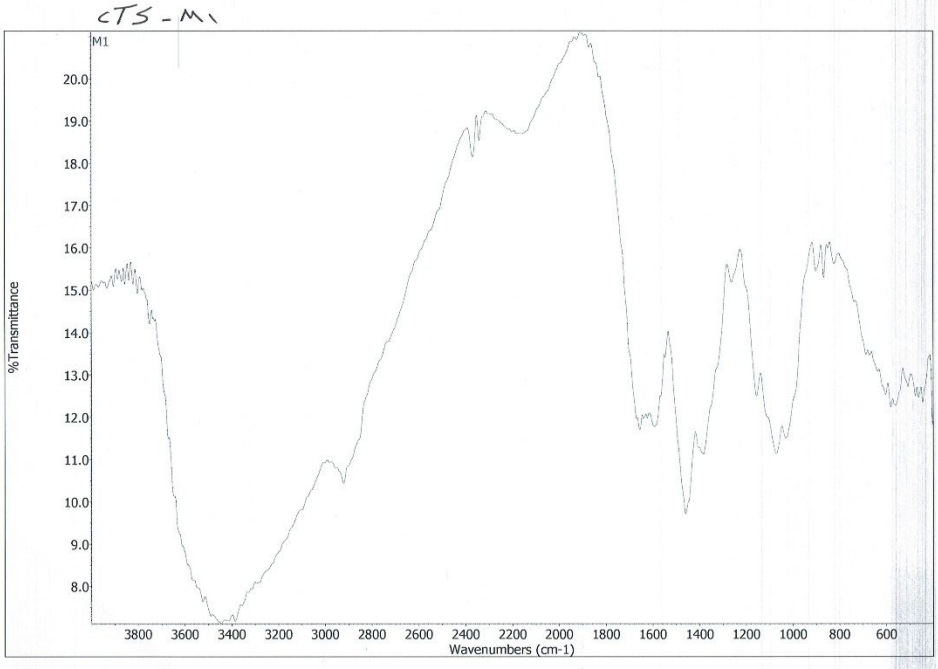


Figure S12: FT-IR spectrum of CS-P3

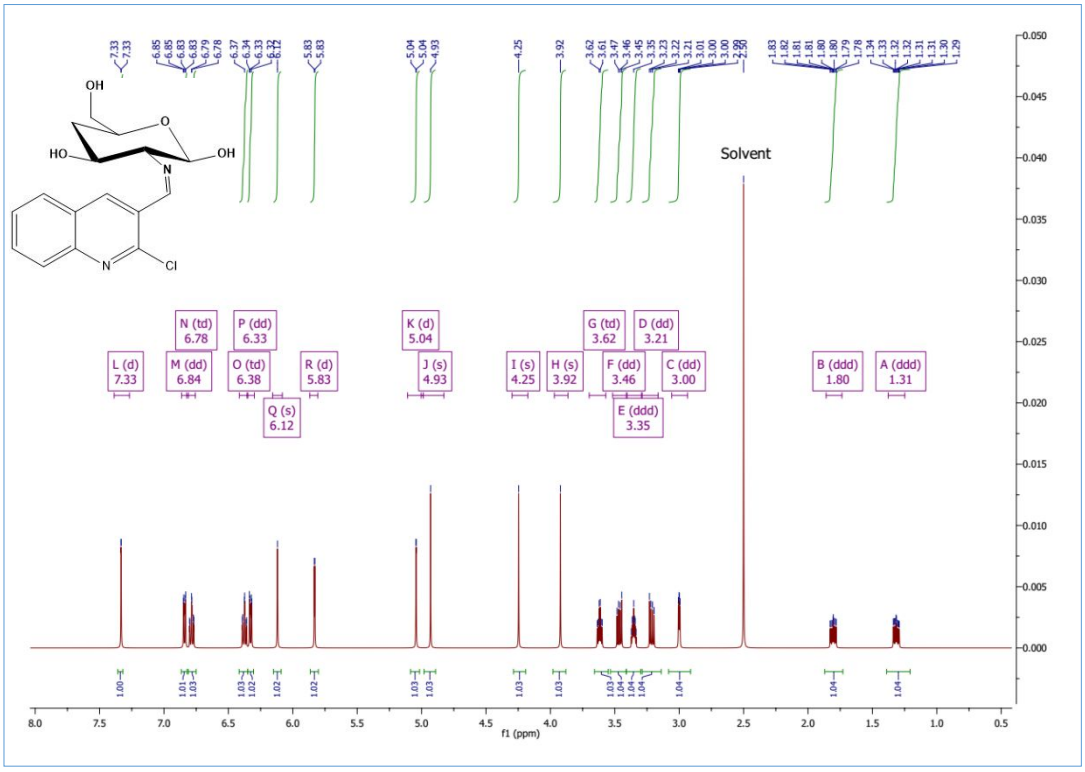


Figure S13: ^{1}H NMR form compound CS-P1

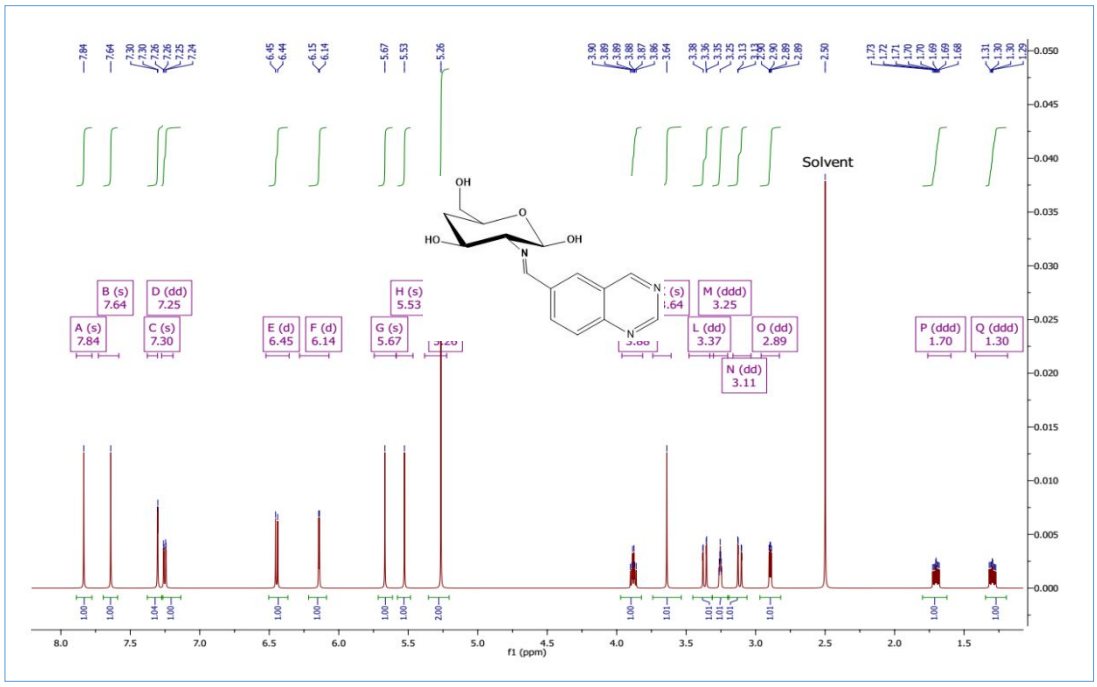


Figure S14: ^{1}H NMR form compound CS-P2

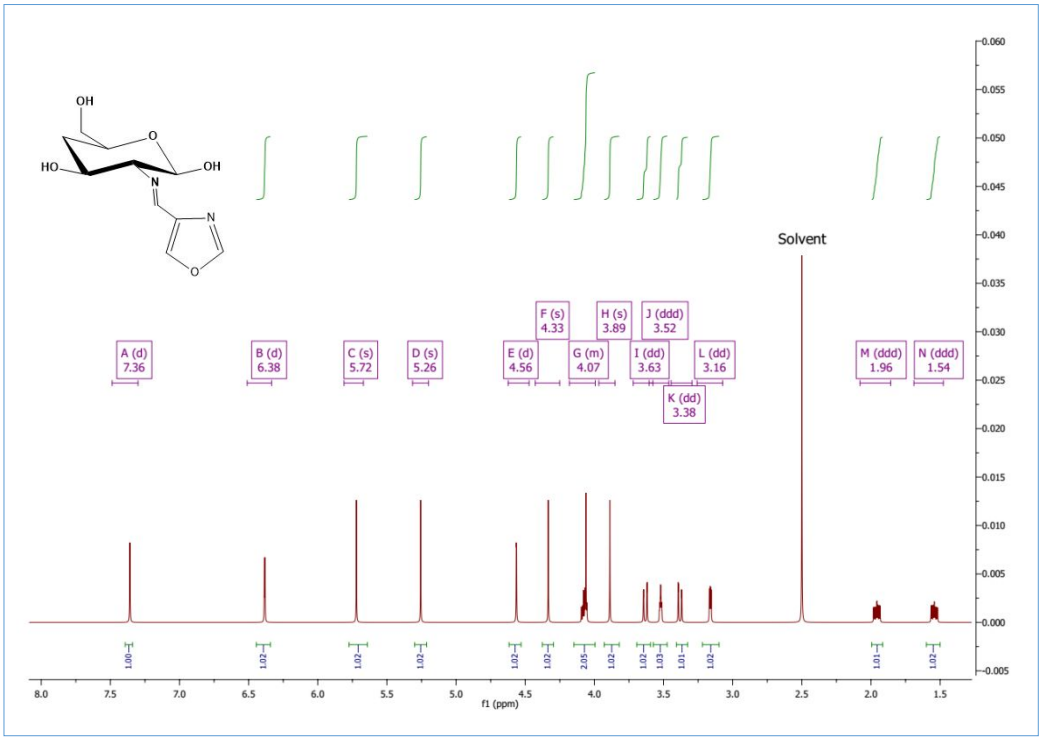


Figure S15: ^{1}H NMR form compound CS-P3

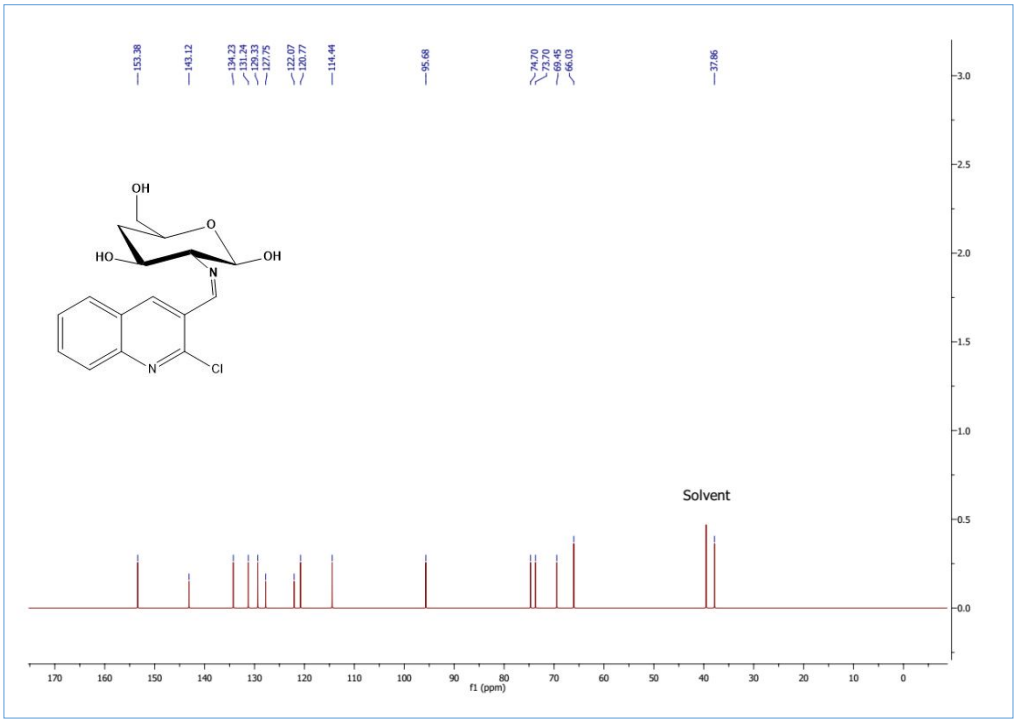


Figure S16: ^{13}C NMR form compound CS-P1

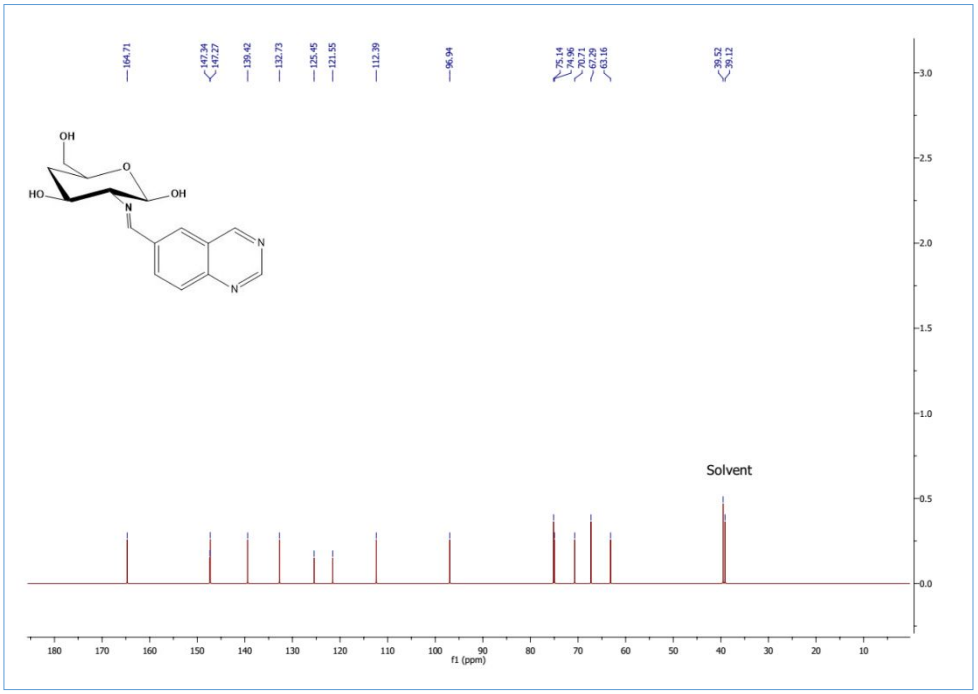


Figure S17: ^{13}C NMR form compound CS-P2

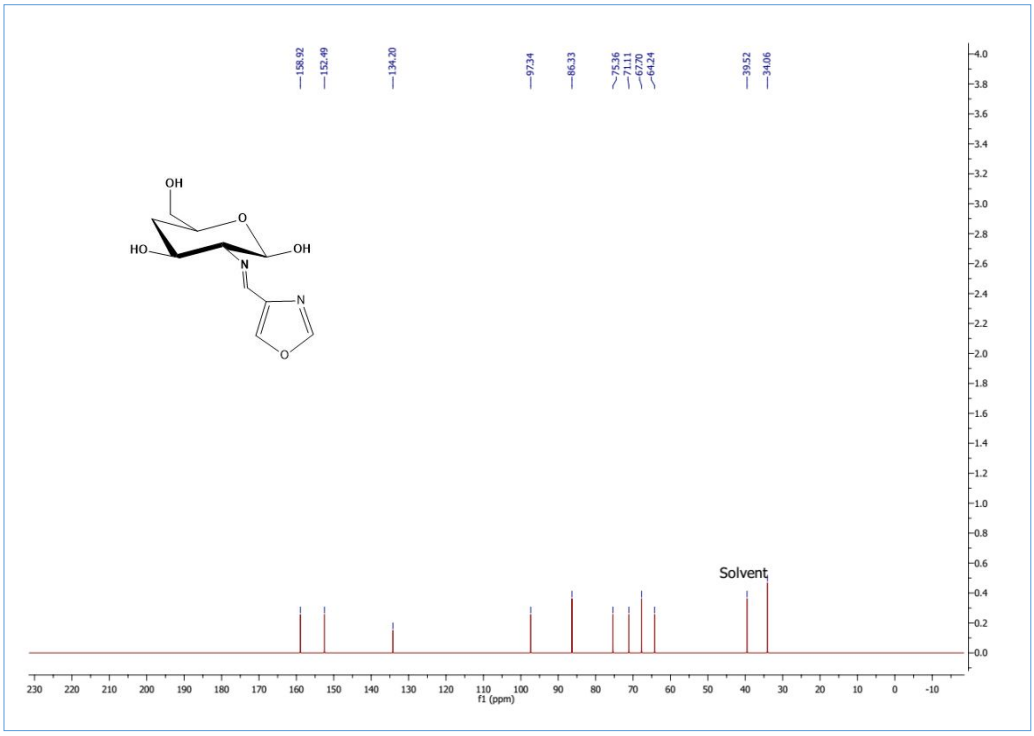


Figure S18: ^{13}C NMR form compound CS-P3