Supporting Information

For

A selective glucose sensor: cooperative effect by monboronic acid-modified poly(amidoamine) dendrimers

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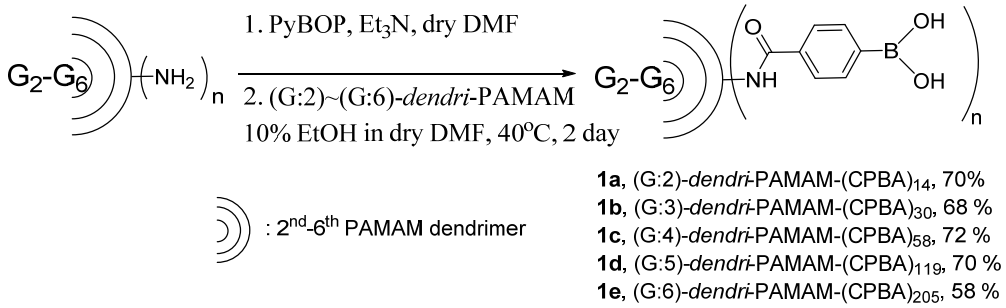
General Consideration.

PAMAM dendrimers were purchased from Dendritech. Co. Chemicals were purchased from Acros, Merck and Sigma-Aldrich Co. Analytical thin-layer chromatography were pre-coated and detected at 254 nm by UV lamp. MALDI-Mass spectra were recorded from Autoflex III MALDI-TOF system (Bruker Daltonics). NMR spectra were obtained on a Varian 400MHz spectrometer and JOEL 400MHz spectrometer. UV-Vis spectra were collected by Agilent 8453. Fluorescence spectra were collected by Varian. Gel permeation chromatography (GPC) experiments were obtained using an Agilent HPLC system (1100 series) and performed using TSK G2000sw column (7.5x 300 mm, 10μm size).

Preparation and characterization of boronic acid modified PAMAM dendrimers

Boronic acid modified PAMAM dendrimers (1a-1e)

Scheme S 1 Synthesis of CPBA functionalized 2nd to 6th PAMAM dendrimers.



(G:2)-*dendri*-PAMAM-(CPBA)$_{14}$ **(1a)**

The solution of PyBOP (51 mg, 0.98 mmol), CPBA (163 mg, 0.98 mmol), Et_3N (0.13 mL, 0.98 mmol) in dry DMF (10 mL), was stirred for 20 min. To the resulting mixture was added the solution of (G:2)-*dendri*-PAMAM-(NH_2)$_{16}$ (100 mg, 0.03 mmol) in 10 % EtOH/DMF (11 mL) and stirred at 40ºC for 2 days. The solid were filtrated and dissolved in MeOH (5 mL) for the following column chromatography purification. (Sephadex LH20, 3.5 x 60 cm, eluted by MeOH) to give the white solid. (110 mg, 70 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.80 (br s, 56H), 3.60 (m, 26H), 3.50 (m, 72H), 3.38 (m, 46H), 3.15 (m, 20H), 2.83 (m, 18H), 2.74 (m, 46H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.6, 172.8, 170.3, 138.7, 136.7, 135.0, 127.5, 53.8, 51.4, 40.4, 35.9, 30.2; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 24.7

Mass (MALDI, m/z, sinapinic acid (SA): **1a**=20:1): Calculated for $C_{240}H_{358}B_{14}N_{58}O_{70}Na_1$ $[M+Na]^+$: 5350. Found: 5350, PDI :1.16

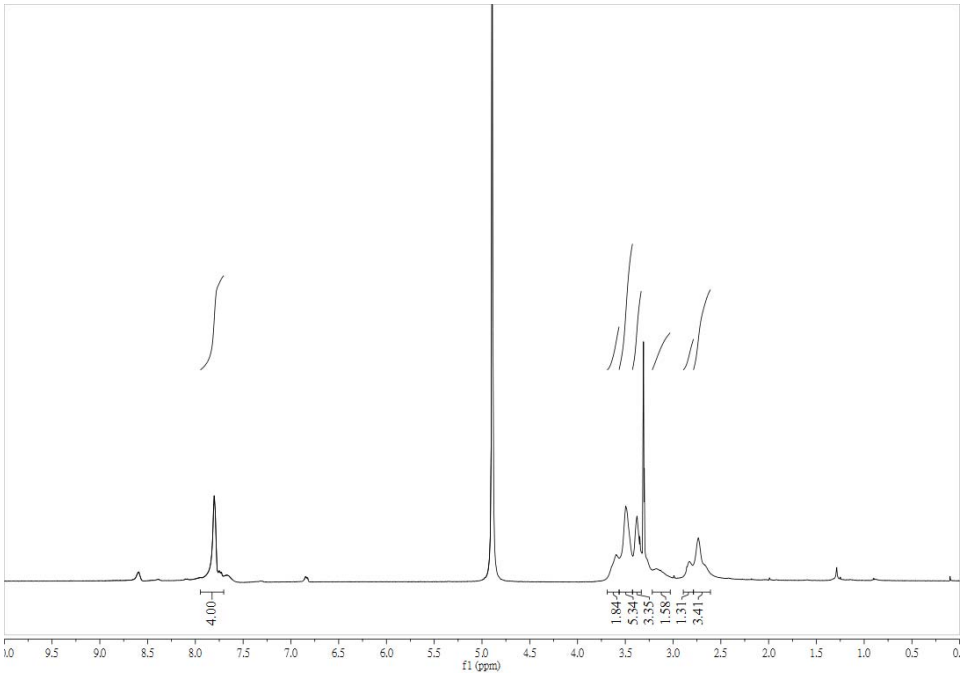


Figure S 1 ^{1}H NMR spectra of dendrimer **1a**.

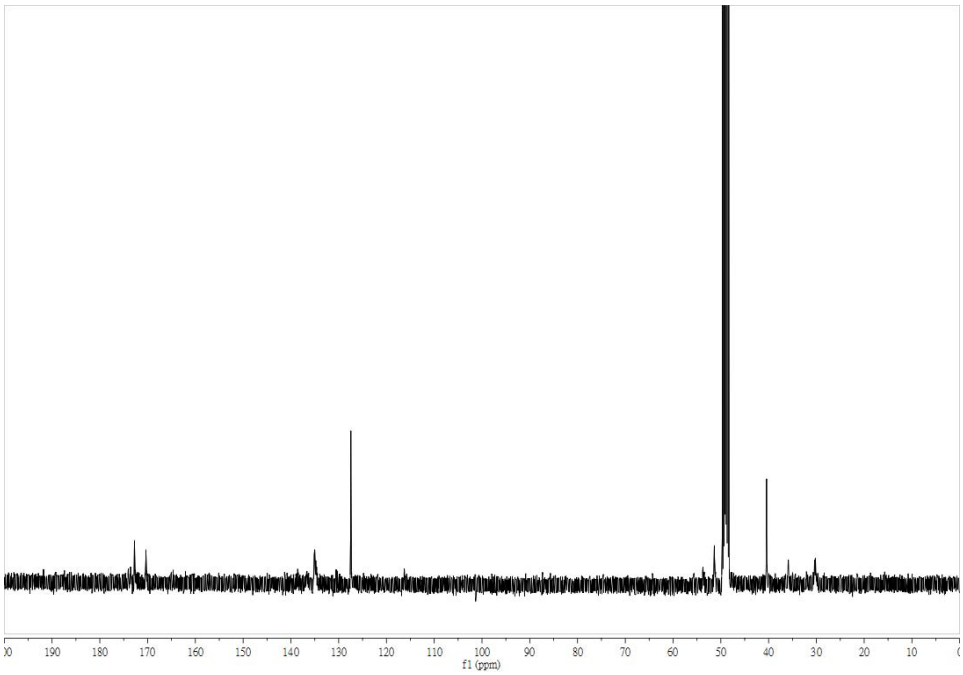


Figure S 2 ^{13}C NMR spectra of dendrimer **1a**.

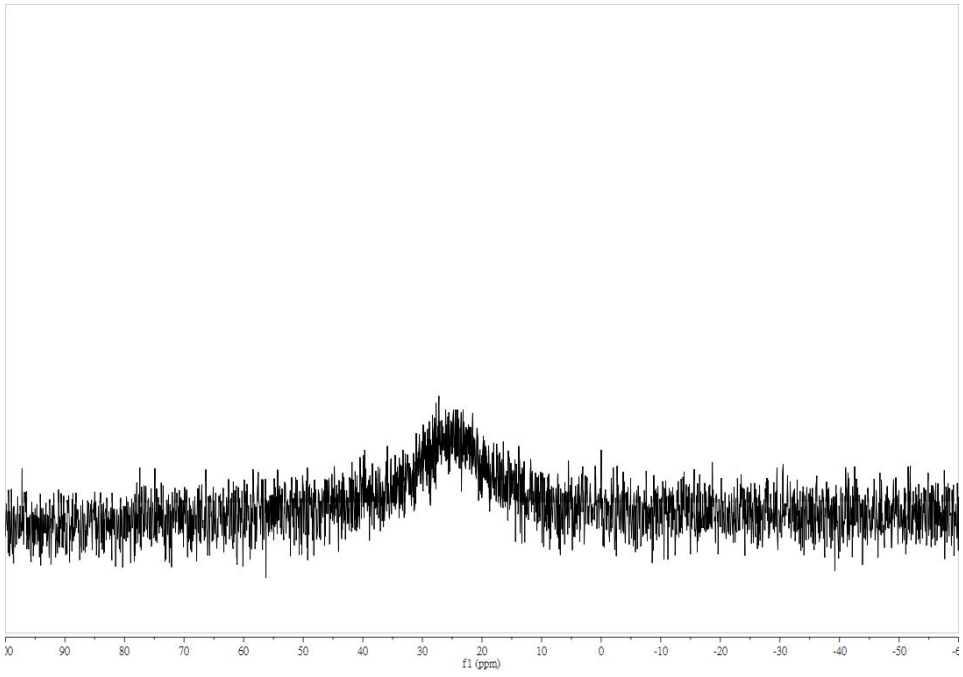


Figure S 3 ^{11}B NMR spectra of dendrimer **1a**.

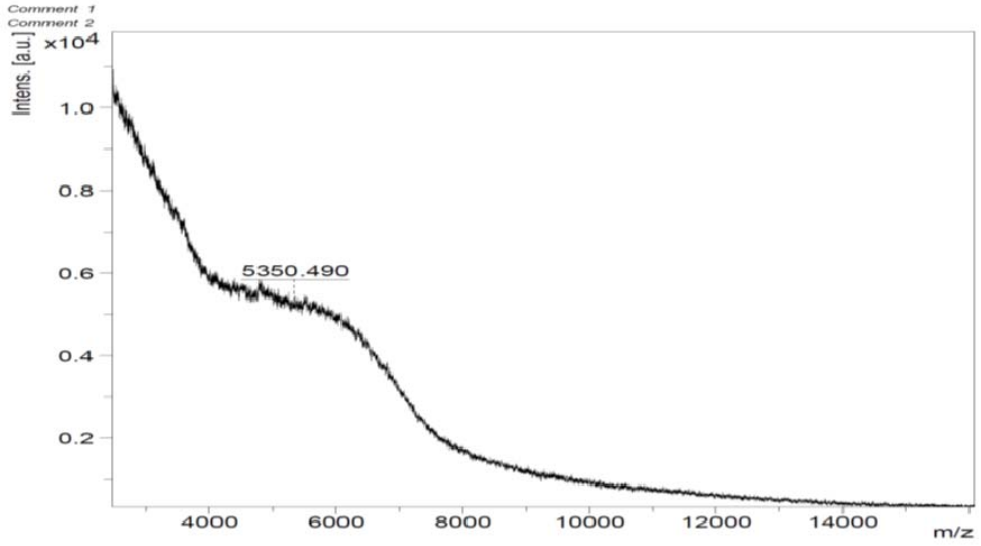


Figure S 4 MALDI-TOF MS spectra of dendrimer **1a**.

(G:3)-*dendri*-PAMAM-(CPBA)$_{30}$ **(1b)**

The procedure used to synthesize **1a** was applied to synthesized **1b** (112 mg, 68%). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.80 (br s, 120H), 3.62 (m, 116H), 3.50 (m, 152H), 3.38 (m, 74H), 2.88 (m, 62H), 2.77 (m, 80H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.4, 172.5, 170.3, 138.6, 136.8, 135.1, 127.4, 53.7, 51.4, 40.4, 35.6, 30.7, 29.9; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 25.1

Mass (MALDI, m/z, SA: **1b**=20:1): Calculated for $C_{511}H_{756}B_{30}N_{122}O_{150}K_1$ $[M+K]^+$: 11386. Found: 11386, PDI :1.16

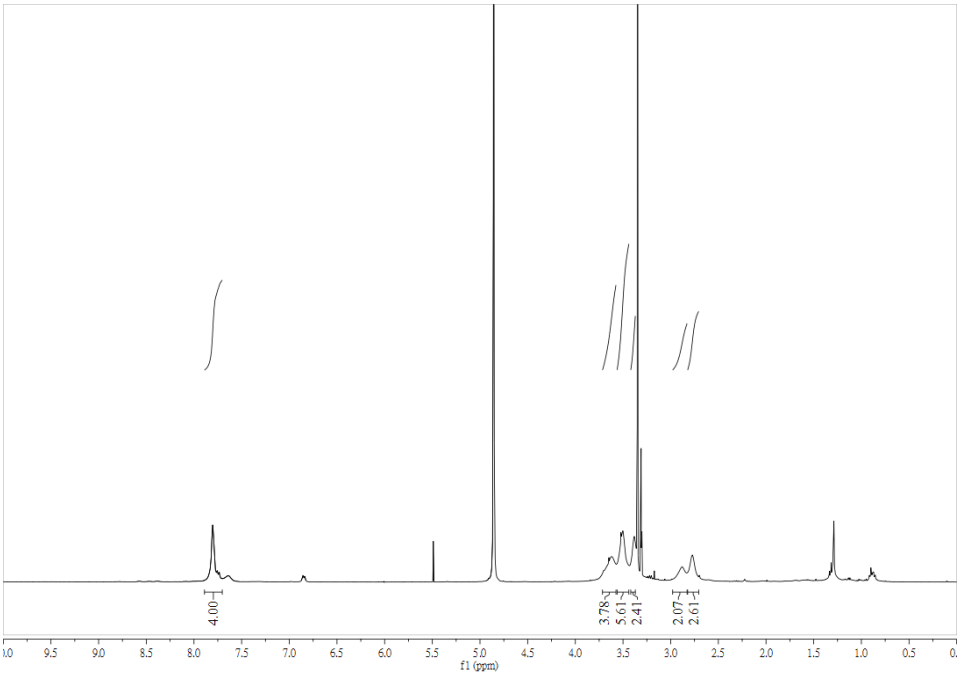


Figure S 5 ^{1}H NMR spectra of dendrimer **1b**.

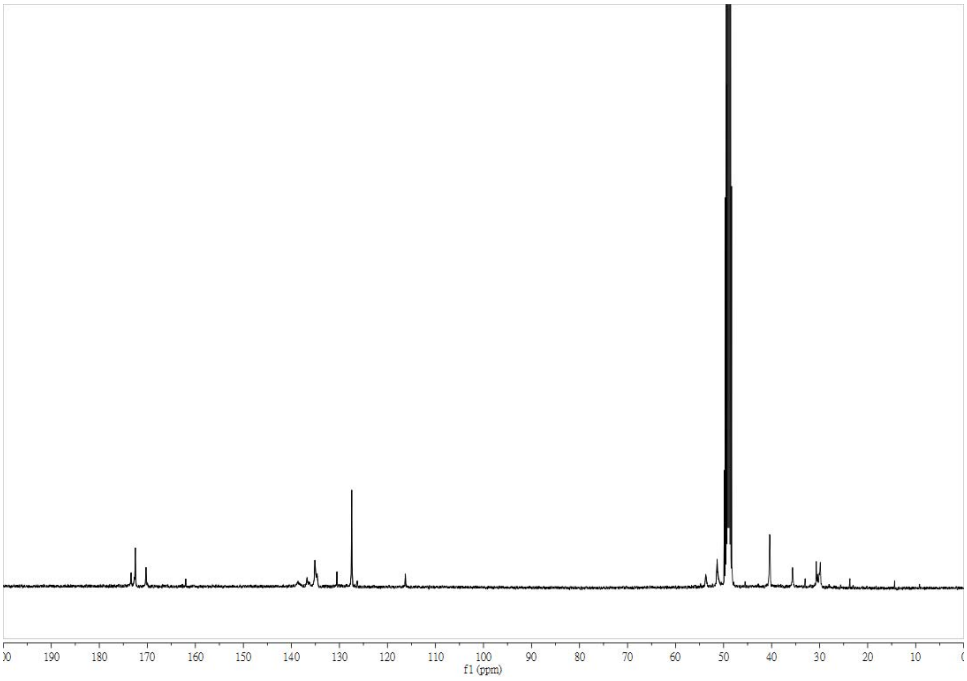


Figure S 6 ^{13}C NMR spectra of dendrimer **1b**.

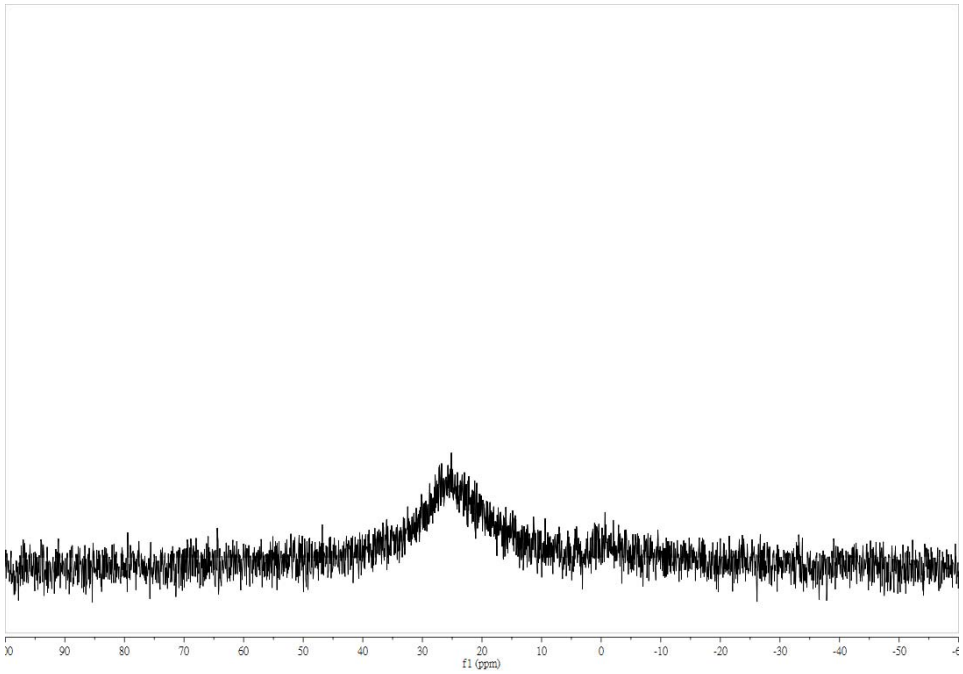


Figure S 7 ^{11}B NMR spectra of dendrimer **1b**.

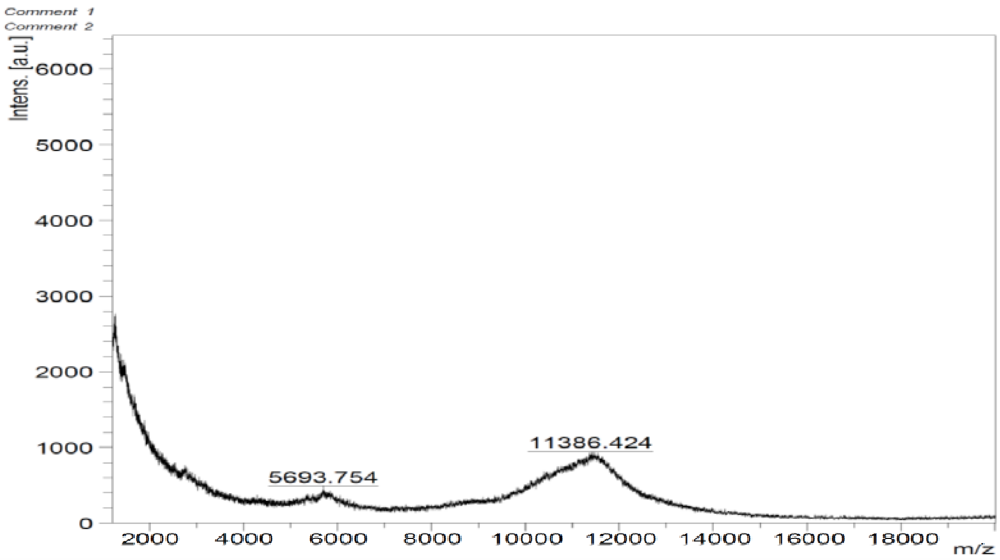


Figure S 8 MALDI-TOF MS spectra of dendrimer **1b**.

(G:4)-*dendri*-PAMAM-(CPBA)$_{58}$ **(1c)**

The procedure used to synthesize **1a** was applied to synthesized **1c**. (115 mg, 72 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.76 (br s, 232H), 3.48 (m, 160H), 3.38 (m, 216H), 3.09 (m, 254H) , 2.91 (m, 120H);, 2.52 (m, 246H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.9, 170.3, 138.5, 136.6, 134.9, 127.4, 53.4, 51.3, 40.6, 37.2, 32.0; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 24.4

Mass (MALDI, m/z, SA: **1c**=20:1): Calculated for $C_{1028}H_{1539}B_{58}N_{250}O_{298}$ $[M+H]^+$: 22797 Found: 22797, PDI :1.25

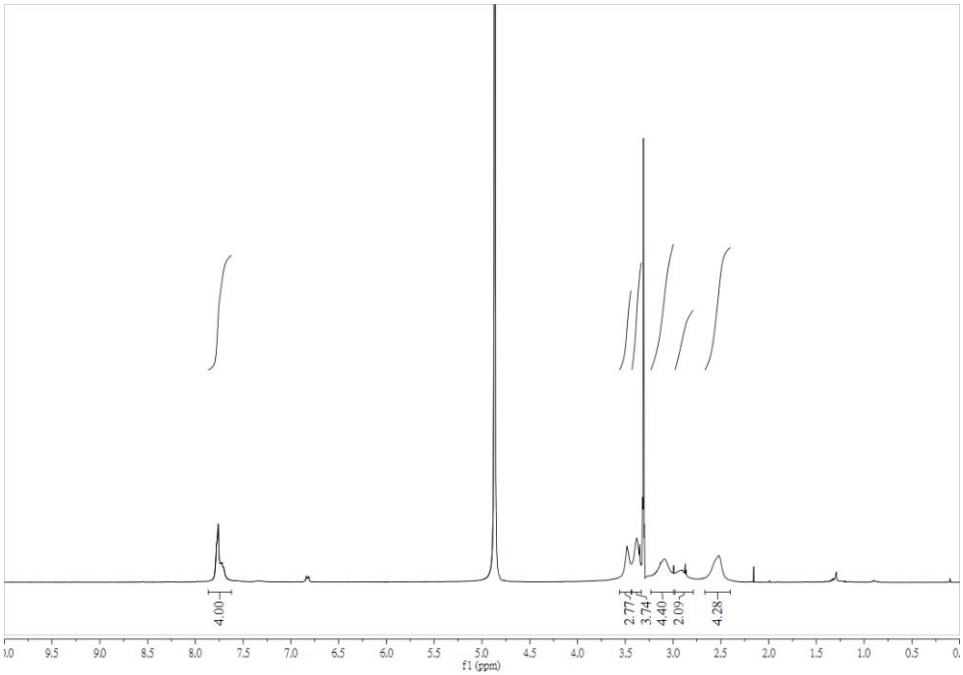


Figure S 9 ^{1}H NMR spectra of dendrimer **1c**.

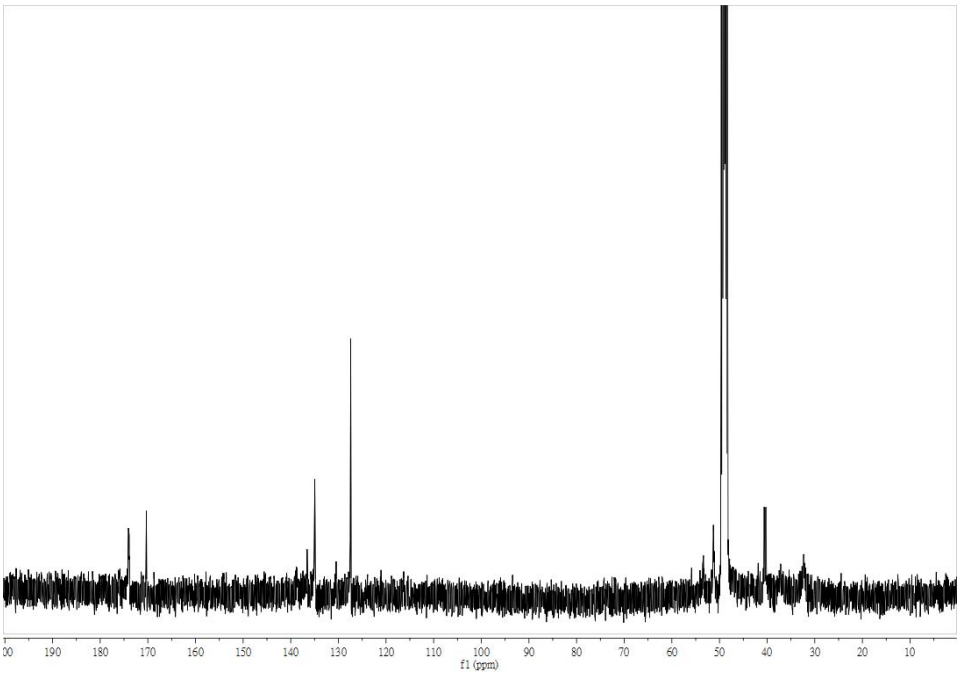


Figure S 10 ^{13}C NMR spectra of dendrimer **1c**.

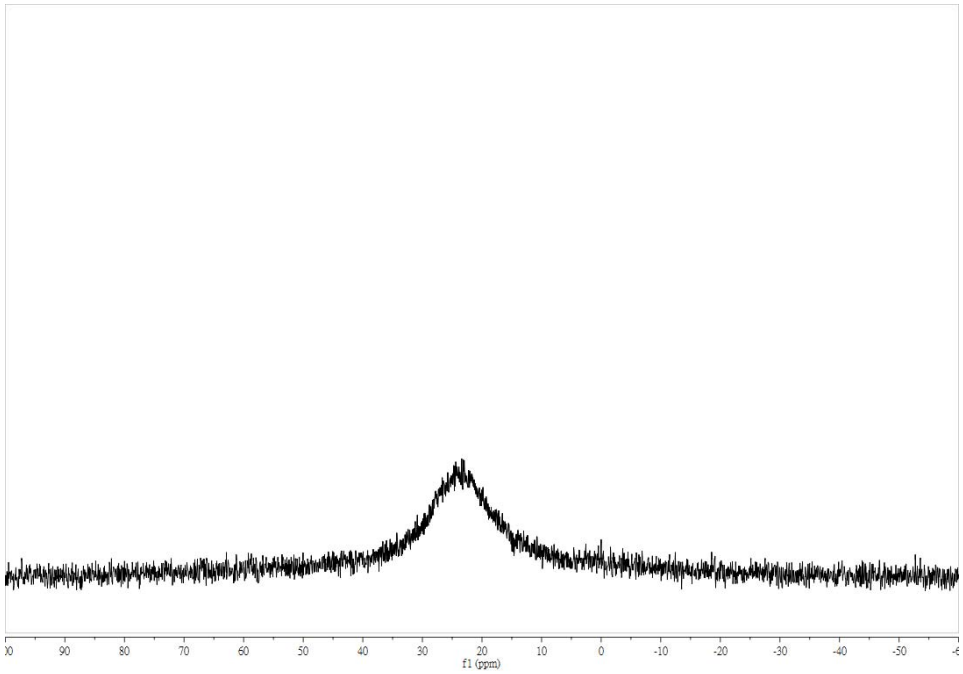


Figure S 11 ^{11}B NMR spectra of dendrimer **1c**.

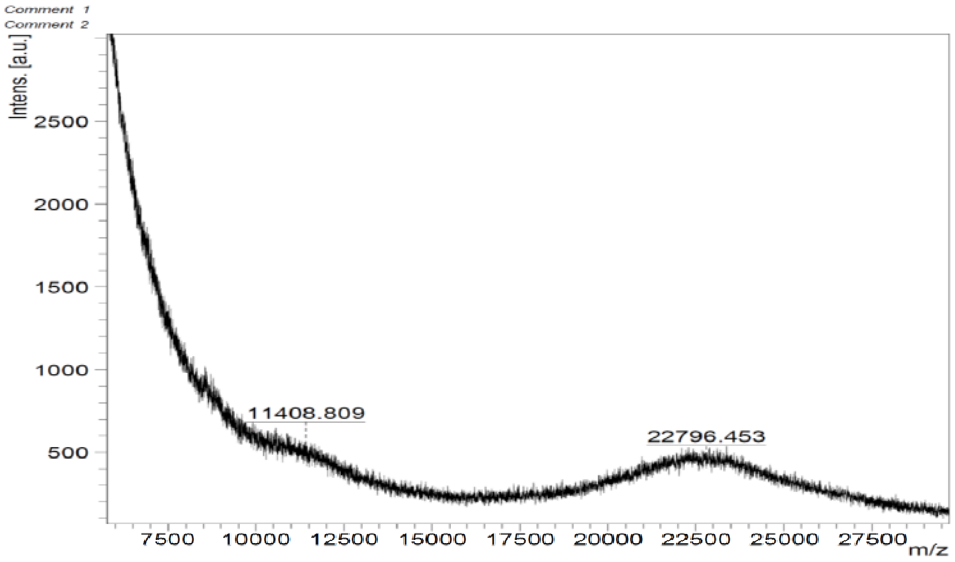


Figure S 12 MALDI-TOF MS spectra of dendrimer **1c**.

(G:5)-*dendri*-PAMAM-(CPBA)$_{119}$ **(1d)**

The procedure used to synthesize **1a** was applied to synthesized **1d**. (112 mg, 70 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.78 (br s, 476H), 3.49 (m, 626H), 3.38 (m, 566H), 3.24 (m, 332H), 2.70 (m, 496H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.6, 172.9, 170.3, 138.6, 136.7, 135.1, 127.5, 53.7, 51.3, 40.4, 36.1, 30.8; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 23.2

Mass (MALDI, m/z, SA: **1d**=20:1): Calculated for $C_{2095}H_{3124}B_{119}N_{506}O_{609}$ $[M+H]^+$: 46432. Found: 46432, PDI :1.16

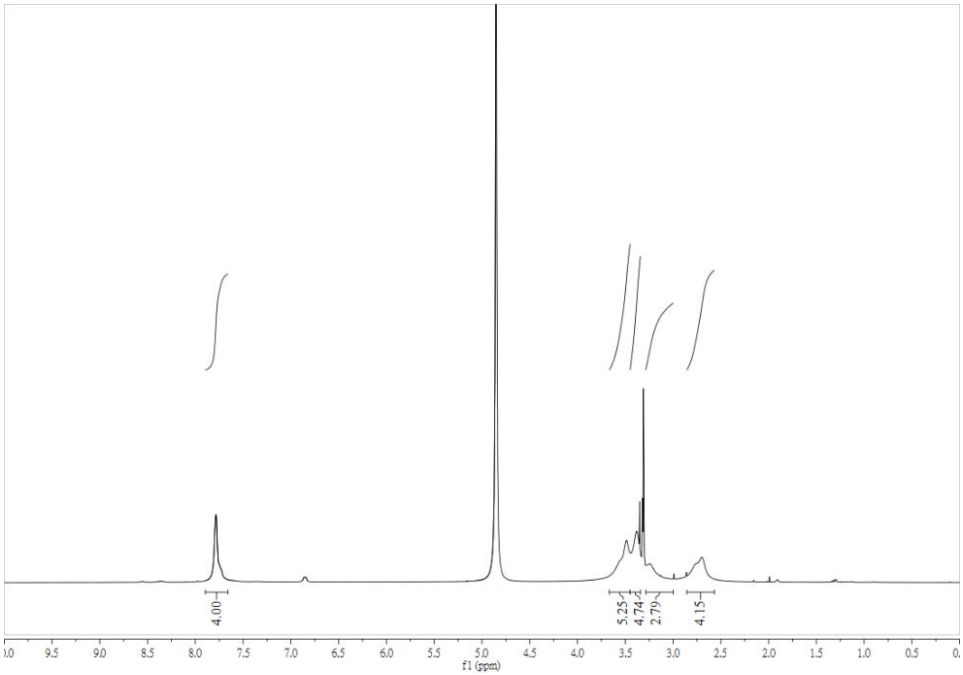


Figure S 13 ^{1}H NMR spectra of dendrimer **1d**.

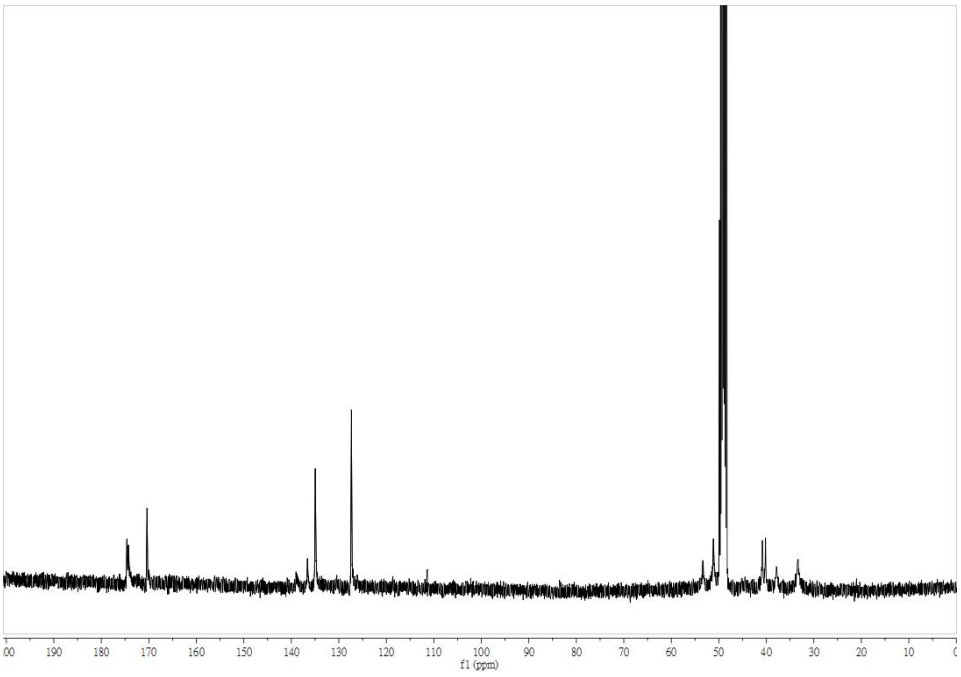


Figure S 14 ^{13}C NMR spectra of dendrimer **1d**.

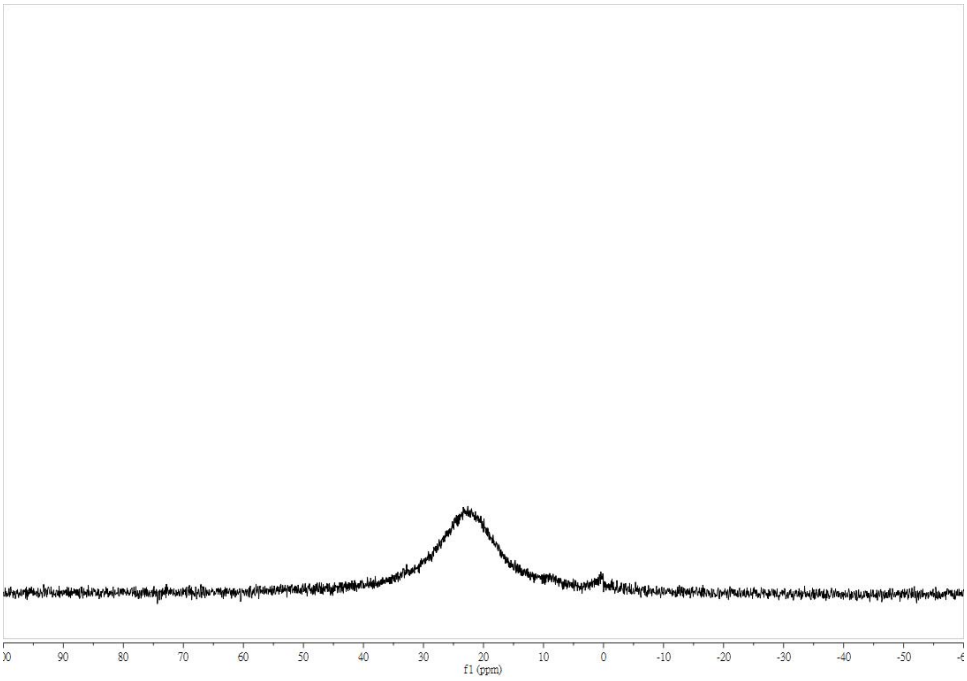


Figure S 15 ^{11}B NMR spectra of dendrimer **1d**.

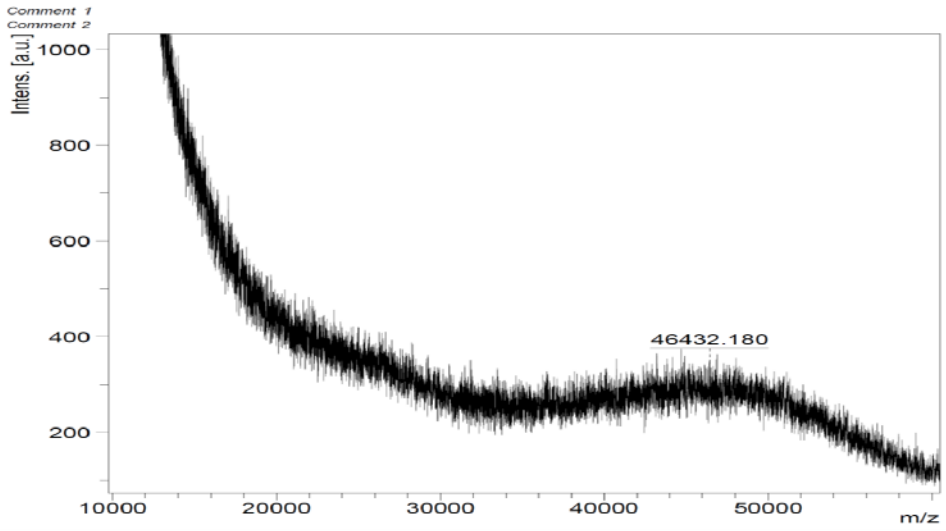


Figure S 16 MALDI-TOF MS spectra of dendrimer **1d**.

(G:6)-*dendri*-PAMAM-(CPBA)$_{205}$ **(1e)**

The procedure used to synthesize **1a** which was also applied to synthesized **1e**. (88 mg, 58 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.79 (br s, 820H), 3.48 (m, 1364H), 3.38 (m,1476H), 2.74 (m, 1228H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.3, 172.6, 170.3, 138.6, 136.7, 135.1, 127.4, 53.6, 51.2, 40.4, 35.8, 30.4; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 23.1

Mass (MALDI, m/z, SA: **1e**=20:1): Calculated for $C_{3970}H_{6108}B_{204}N_{1018}O_{1120}K_6$ [$(M+6K^+)$ /6]: 14768 Found: 14768, PDI :1.13

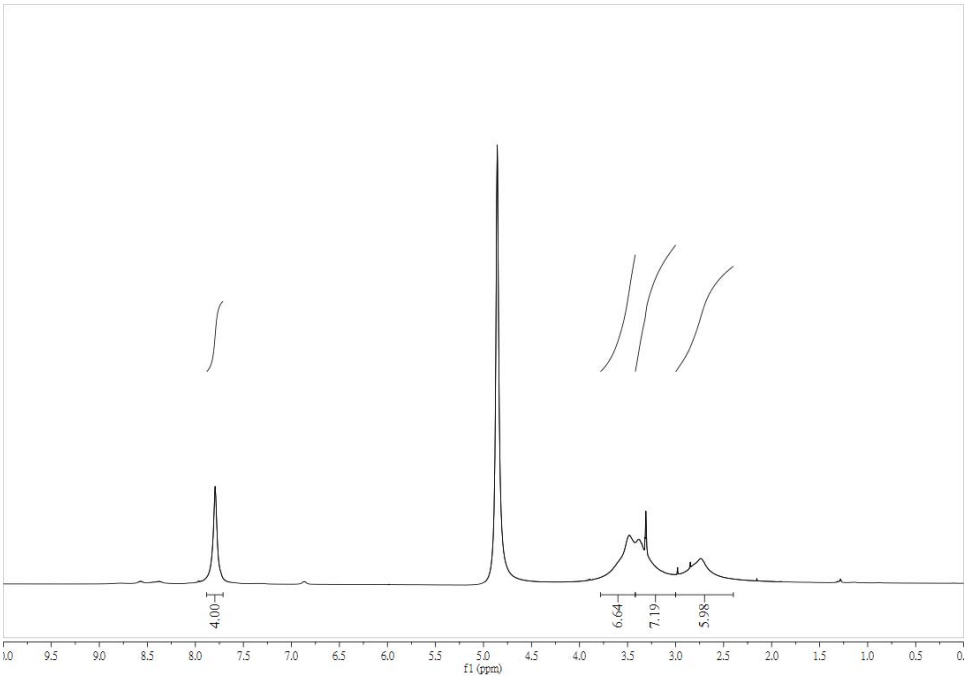


Figure S 17 ^{1}H NMR spectra of dendrimer **1e**.

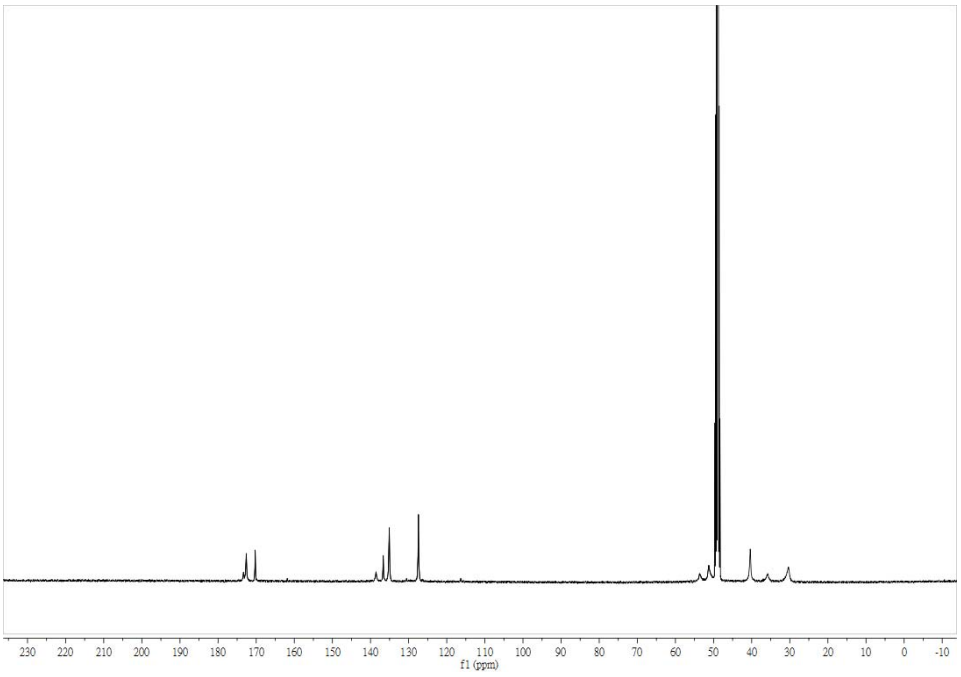


Figure S 18 ^{13}C NMR spectra of dendrimer **1e**.

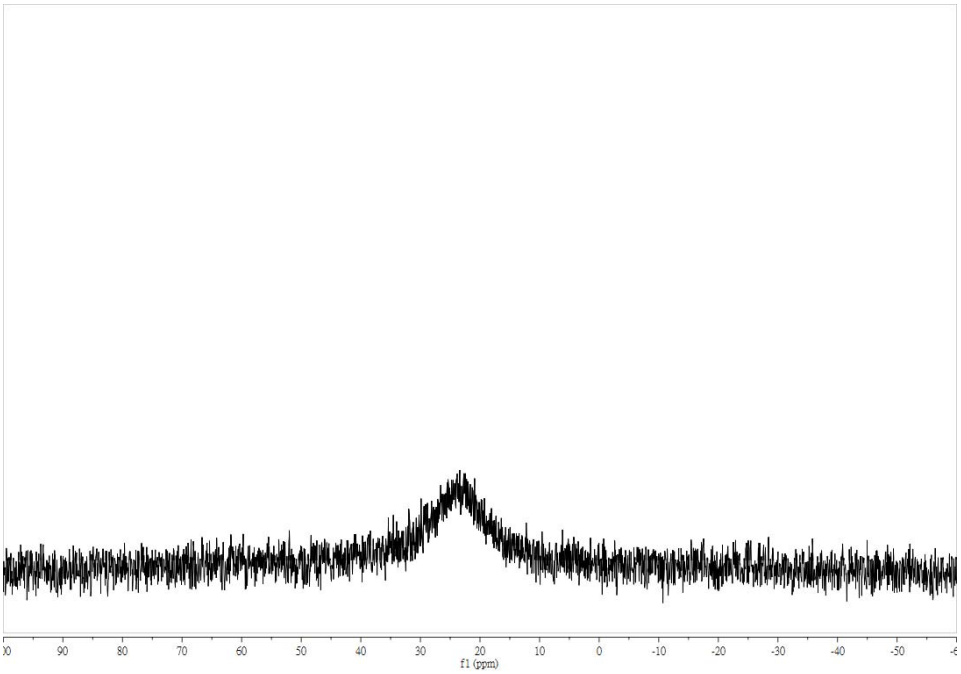


Figure S 19 ^{11}B NMR spectra of dendrimer **1e**.

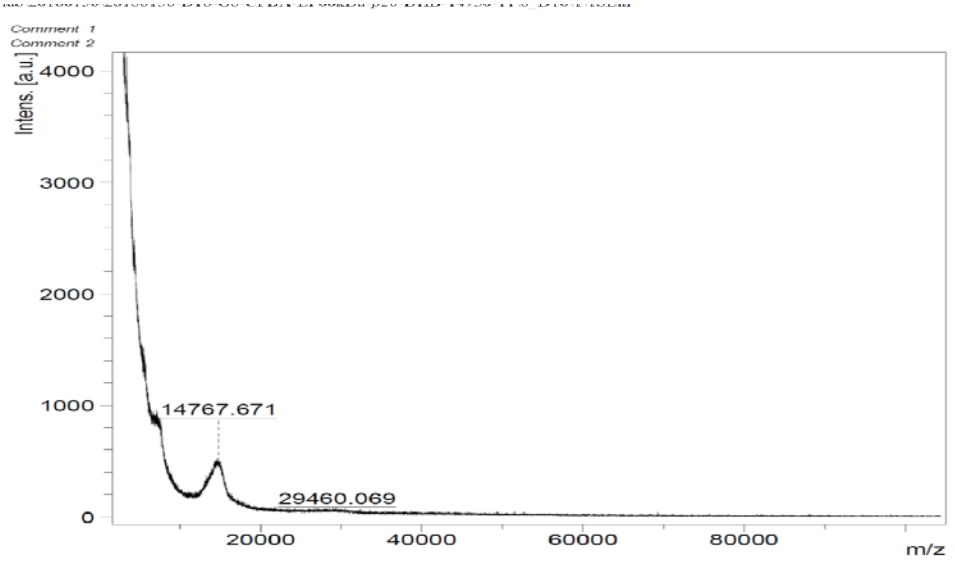
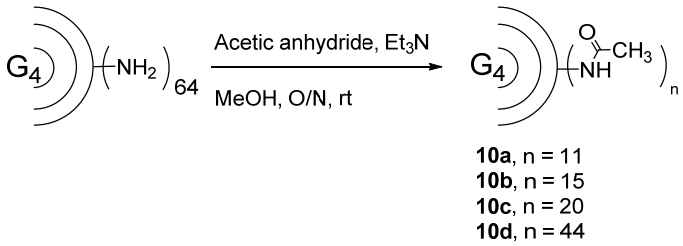


Figure S 20 MALDI-TOF MS spectra of dendrimer **1e**.

Acetyl G3 PAMAM dendrimers (10a-10d)



10a, n = 11
10b, n = 15
10c, n = 20
10d, n = 44

(G:4)-*dendri*-PAMAM-(NHAc)$_{11}$ ***(10a)***

The Et_3N (5.35 μL, 38.46 μmol) was added in the solution of (G:4)-*dendri*-PAMAM-$(NH_2)_{16}$ (71 mg, 4.99 μmol) in MeOH (15 mL), and stirred for 30 min. To the resulting mixture was added acetic anhydride (3.30 μL, 34.96 μmol) dropwise and the reaction was stirred for overnight at room temperature. After stirring overnight, MeOH was removed and purified by column chromatography. (Sephadex LH20, 3.5 x 60 cm, eluted by MeOH) to give the colorless thickness solid. (56 mg, 78 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 3.59 (m, 228H), 3.44 (m, 232H), 3.30 (m, 162H), 3.19 (m, 118H), 2.82 (m, 256H), 1.99 (m, 33H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 174.0, 173.7, 173.3, 54.0, 53.6, 51.3, 51.1, 41.2, 41.0, 40.2, 39.9, 38.3, 36.6, 31.8, 31.4, 23.0

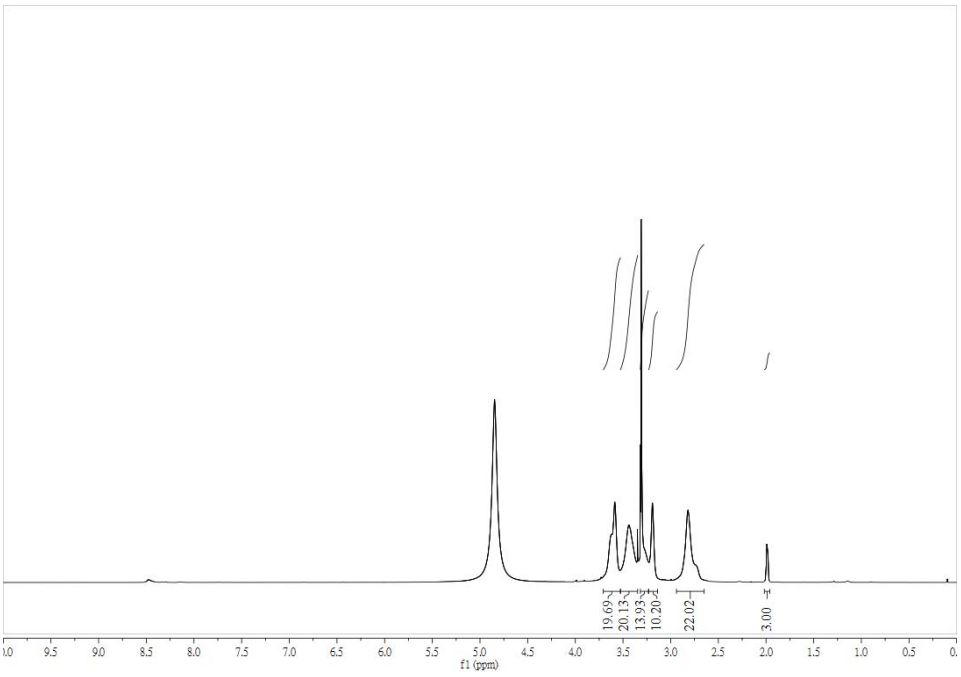


Figure S 21 ^{1}H NMR spectra of dendrimer **10a**.

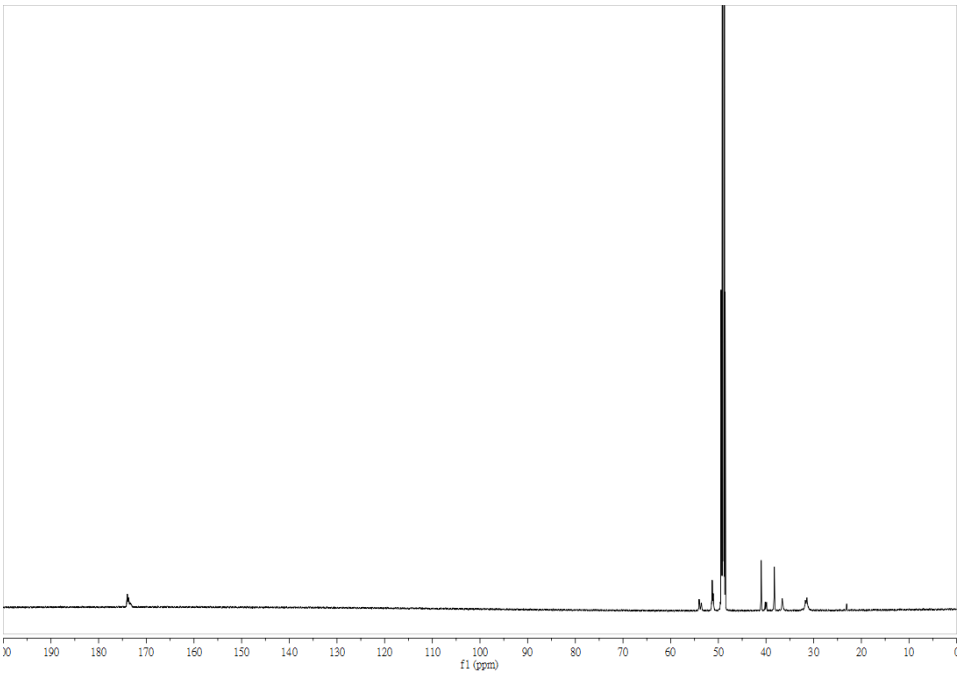


Figure S 22 ^{13}C NMR spectra of dendrimer **10a**.

(G:4)-*dendri*-PAMAM-(NHAc)$_{15}$ ***(10b)***

The procedure used to synthesize **10a** was applied to synthesized **10b** (62 mg, 65 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 3.56 (m, 130H), 3.50 (m, 138H), 3.18 (m, 322H), 3.05 (m, 138H), 2.68 (m, 268H), 1.98 (s, 45H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 174.8, 174.3, 53.9, 53.6, 51.2, 41.0, 40.2, 39.9, 38.2, 37.4, 32.8, 23.1

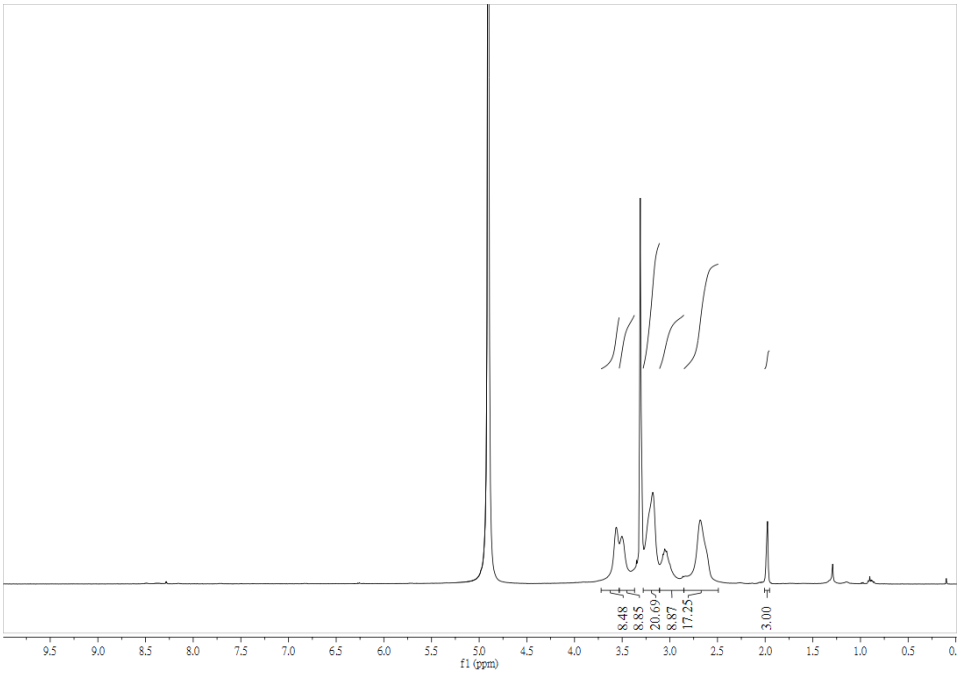


Figure S 23 ^{1}H NMR spectra of dendrimer **10b**.

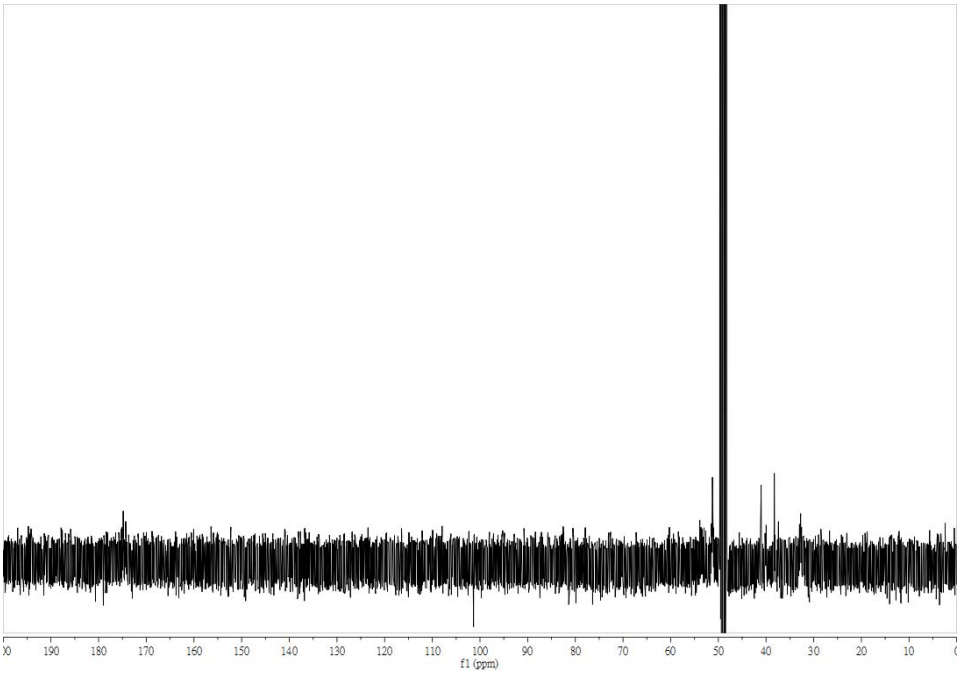


Figure S 24 ^{13}C NMR spectra of dendrimer **10b**.

(G:4)-*dendri*-PAMAM-(NHAc)$_{20}$ ***(10c)***

The procedure used to synthesize **10a** was applied to synthesized **10c** (83 mg, 69 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ: 3.28 (m, 556H), 3.05 (m, 110H), 2.84 (m, 96H), 2.57 (m, 234H), 1.84 (s, 132H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 175.6, 173.3, 172.6, 53.7, 51.3, 41.0, 39.5, 38.2, 35.8, 30.3, 22.0

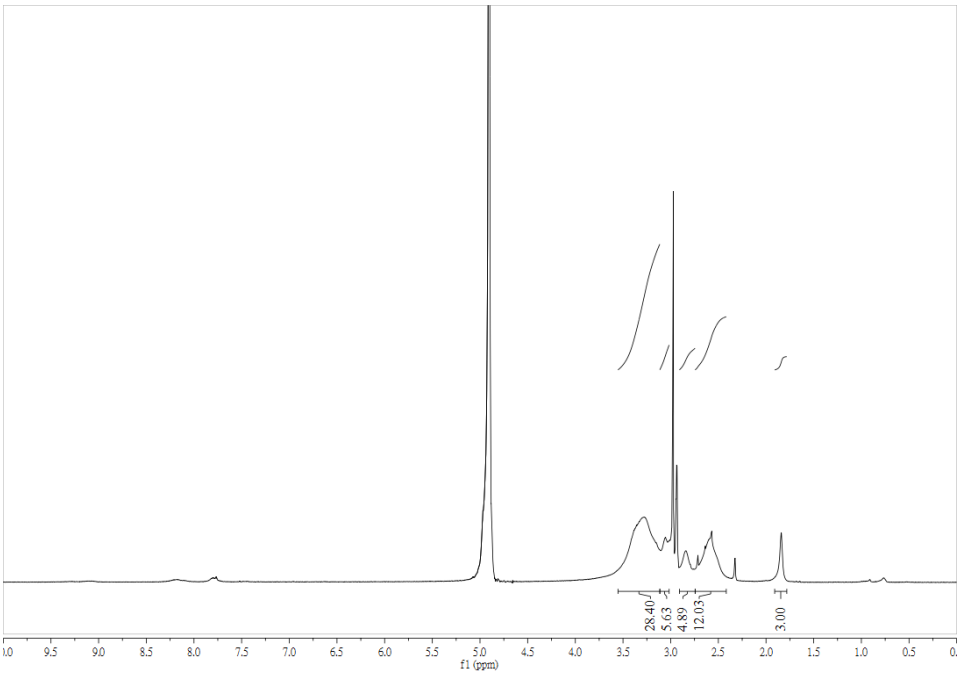


Figure S 25 ^{1}H NMR spectra of dendrimer **10c**.

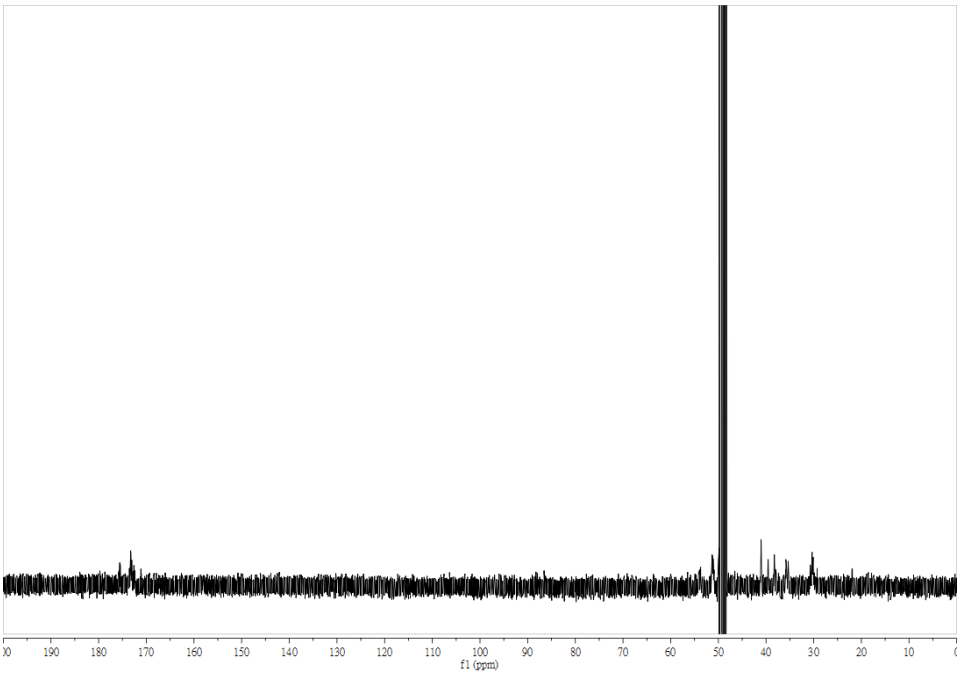


Figure S 26 ^{13}C NMR spectra of dendrimer **10c**.

(G:4)-*dendri*-PAMAM-(NHAc)$_{44}$ ***(10d)***

The procedure used to synthesize **10a** was applied to synthesized **10d** (95 mg, 87 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 3.53 (m, 40H), 3.35 (m, 116H), 3.29 (m, 178H), 3.14 (m, 52H) , 2.94 (m,240H), 2.75 (m, 128H) , 2.47 (m, 242H), 1.98 (m, 132H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 175.1, 174.7, 173.5, 53.4, 51.1, 41.4, 40.1, 40.0, 38.6, 34.7,29.7, 22.9

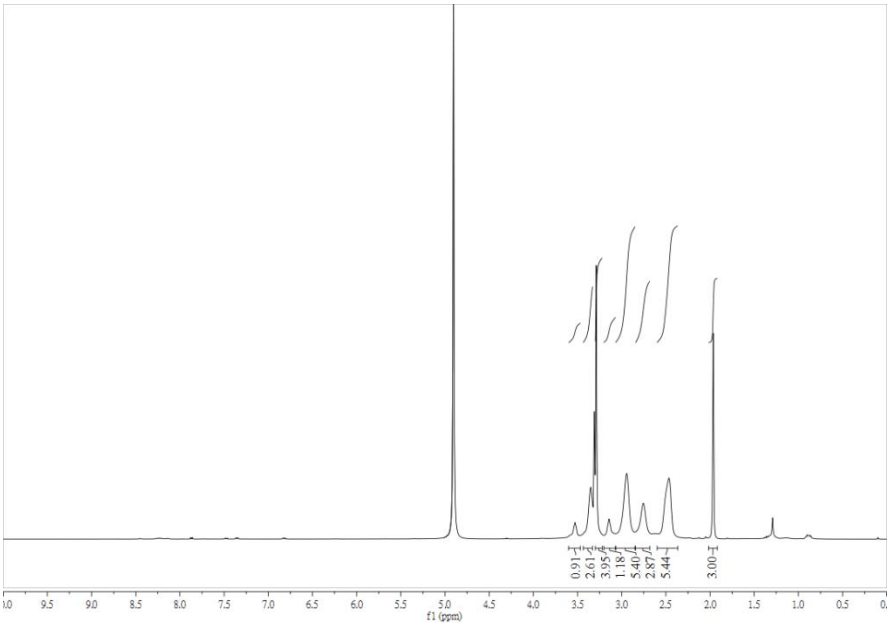


Figure S 27 ^{1}H NMR spectra of dendrimer **10d**.

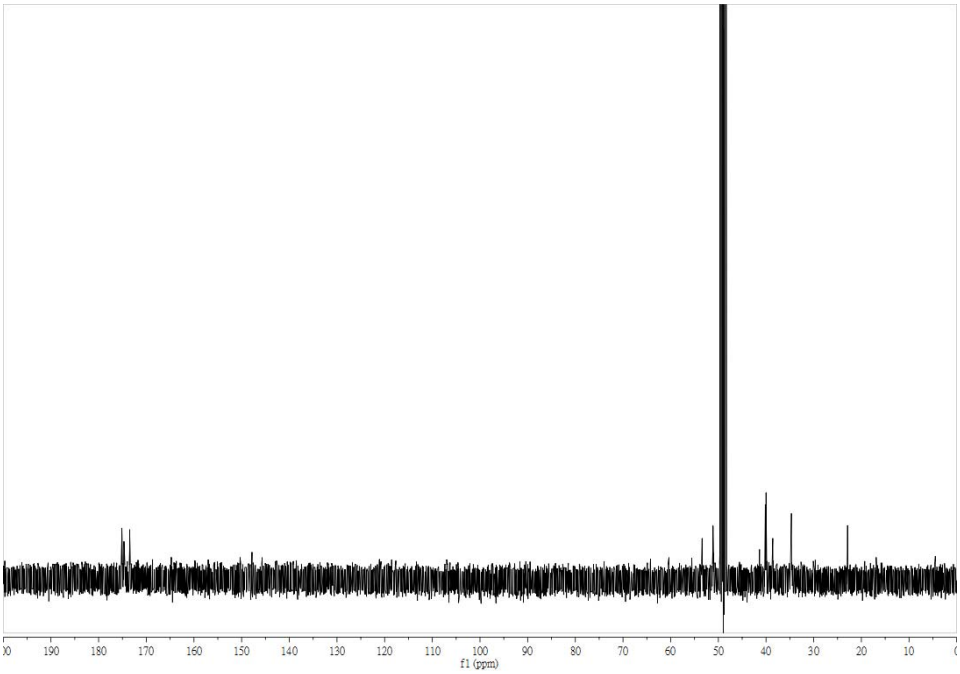
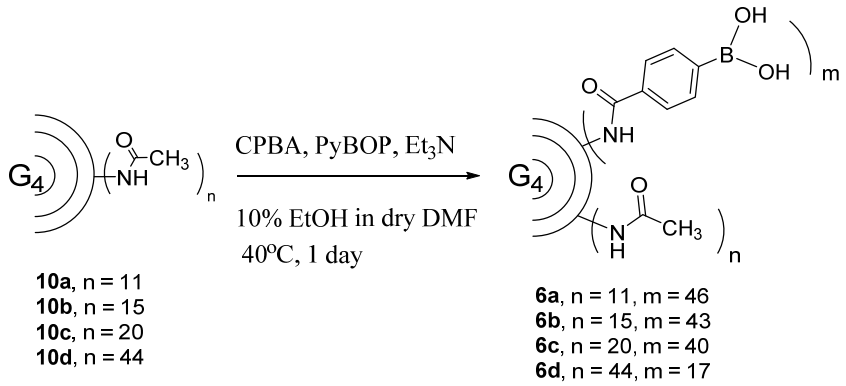


Figure S 28 ^{13}C NMR spectra of dendrimer **10d**.

Preparation of boronic acid-modified acetyl G3 PAMAM dendrimers (6a-6d)

Scheme S 3 Synthesis of acetic anhydride and CPBA functionalized 4th PAMAM dendrimers.



(G:4)-*dendri*-PAMAM-$(NHAc)_{11}$-$(CPBA)_{46}$ **(6a)**

The solution of PyBOP (160.68 mg, 0.31 mmol), CPBA (51.24 mg, 0.31 mmol), Et_3N (0.04 mL, 0.31 mmol) in dry DMF (10 mL), was stirred for 20 min. To the mixture was added the solution of **10a** (40.0 mg, 2.76 μmol) in 10 % EtOH/DMF (11 mL). After the addition, the mixture was stirred at 40°C for 1 day. The reaction was concentrated and then was dissolved in MeOH for column chromatography puification. (Sephadex LH20, 3.5 x 60 cm, eluted by MeOH) to give the colorless thickness solid. (37 mg, 61 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.78 (brs, 184H), 3.49 (m, 238H), 3.38 (m, 114H), 3.25 (m, 220H), 3.08 (m, 154H), 2.61 (m,270 H), 1.92 (m, 33H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.6, 173.0, 170.3, 138.6, 136.6, 134.9, 127.5, 53.7, 53.4, 51.3, 40.5, 40.4, 39.6, 36.3, 30.7, 23.1; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ :23.4

Mass (MALDI, m/z, SA: **6a**=20:1): Calculated for $C_{966}H_{1557}B_{46}N_{250}O_{273}Na_1$ $[M+Na]^+$: 21506. Found: 21506, PDI : 1.20

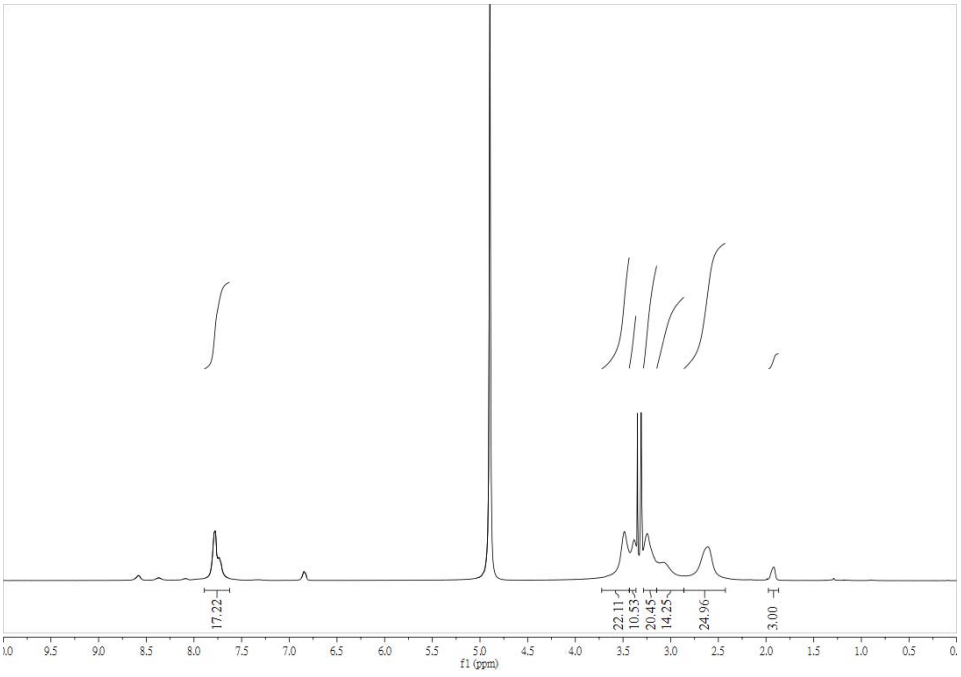


Figure S 29 ^{1}H NMR spectra of dendrimer **6a**.

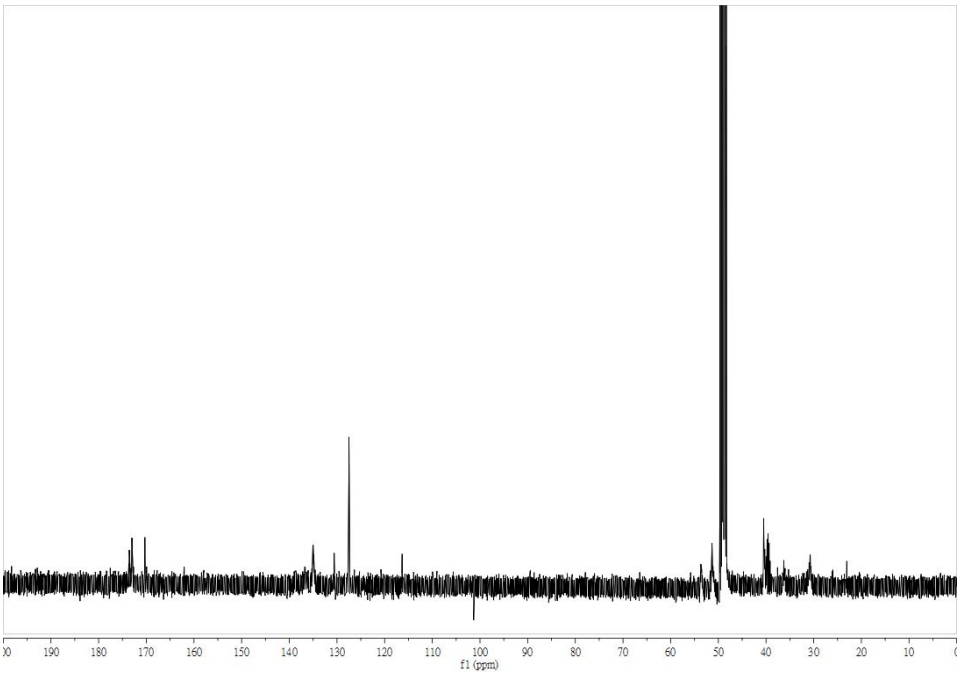


Figure S 30 ^{13}C NMR spectra of dendrimer **6a**.

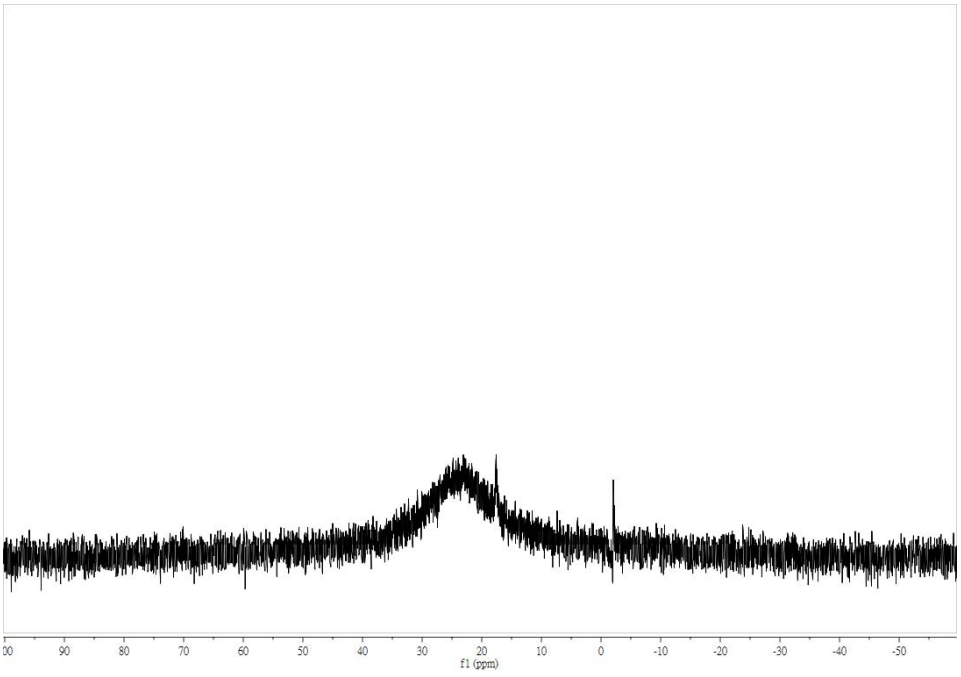


Figure S 31 ^{11}B NMR spectra of dendrimer **6a**.

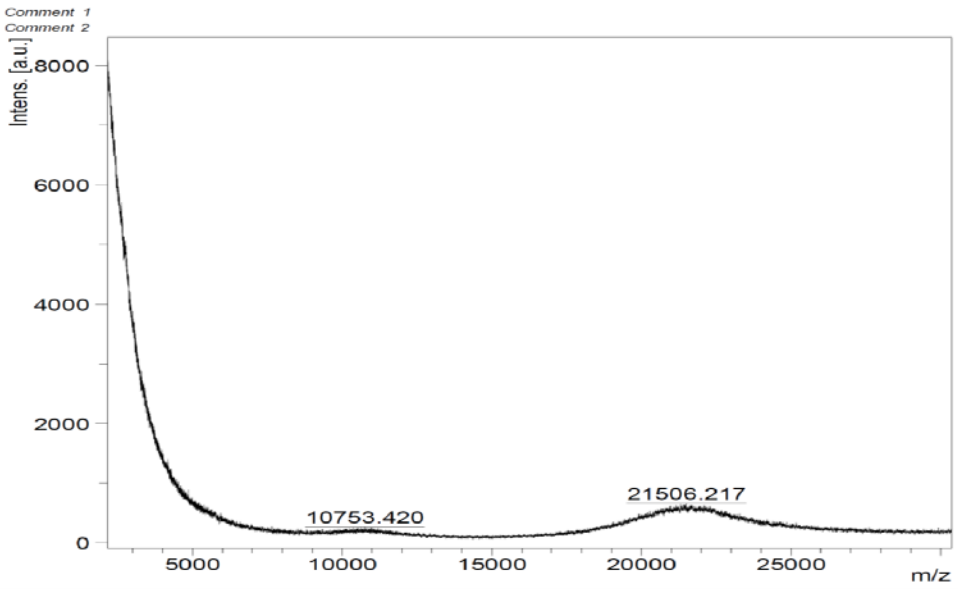


Figure S 32 MALDI-TOF MS spectra of dendrimer **6a**.

(G:4)-*dendri*-PAMAM-(NHAc)$_{15}$-(CPBA)$_{43}$ **(6b)**

The procedure used to synthesize **6a** was applied to synthesized **6b** (57 mg, 51 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.79 (br s, 172H), 3.49 (m, 286H), 3.38 (m, 204H), 3.29 (m, 210H), 2.68 (m, 296H), 1.96 (s, 45H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.7, 173.3, 170.3, 136.8, 135.1, 127.5, 53.7, 51.3, 40.4, 40.0, 36.6, 31.3, 23.0; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 24.3

Mass (MALDI, m/z, SA: **6b**=20:1): Calculated for $C_{952}H_{1551}B_{43}N_{250}O_{268}Na_1$ $[M+Na]^+$: 21230. Found: 21230, PDI : 1.19

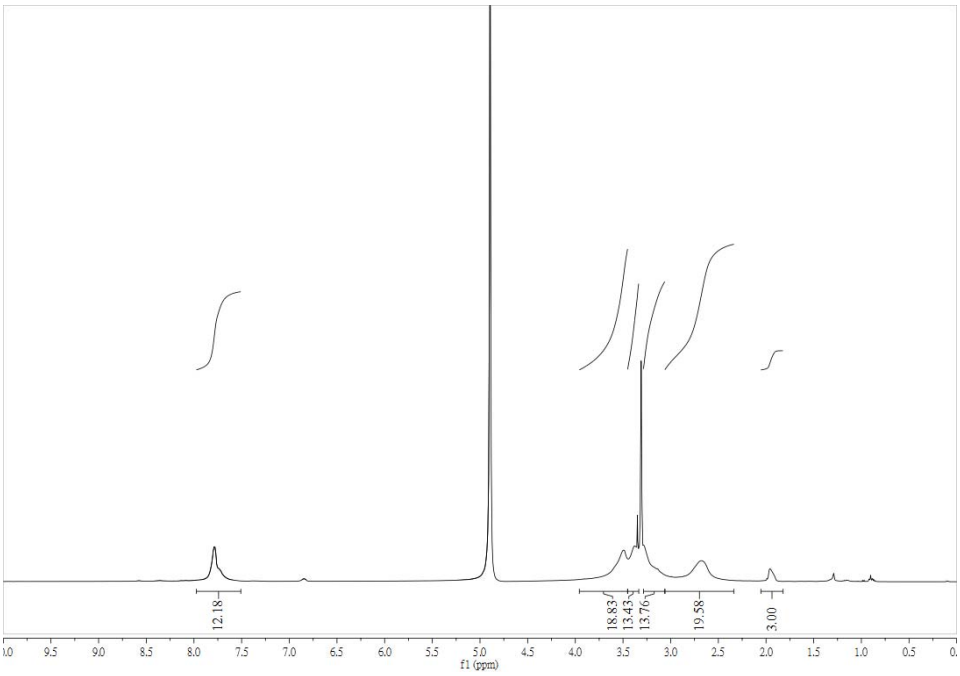


Figure S 33 ^{1}H NMR spectra of dendrimer **6b**.

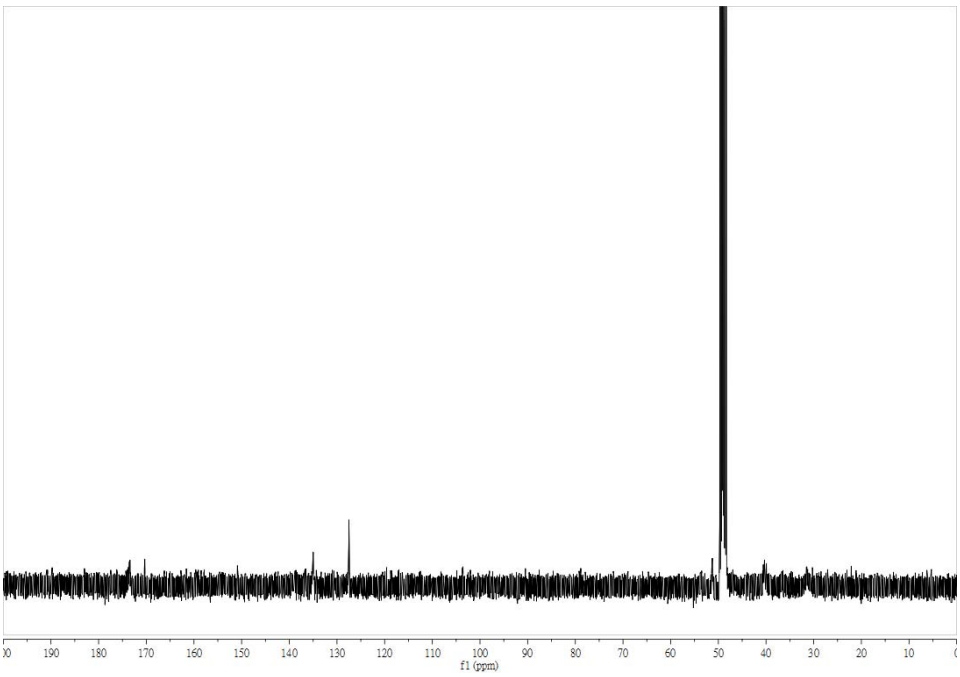


Figure S 34 ^{13}C NMR spectra of dendrimer **6b**.

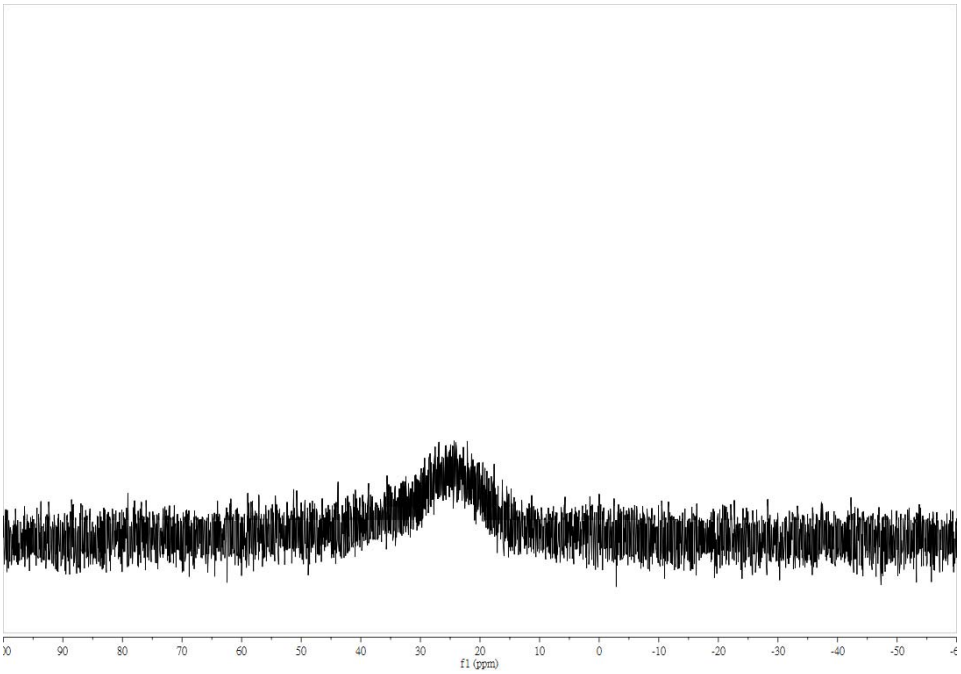


Figure S 35 ^{11}B NMR spectra of dendrimer **6b**.

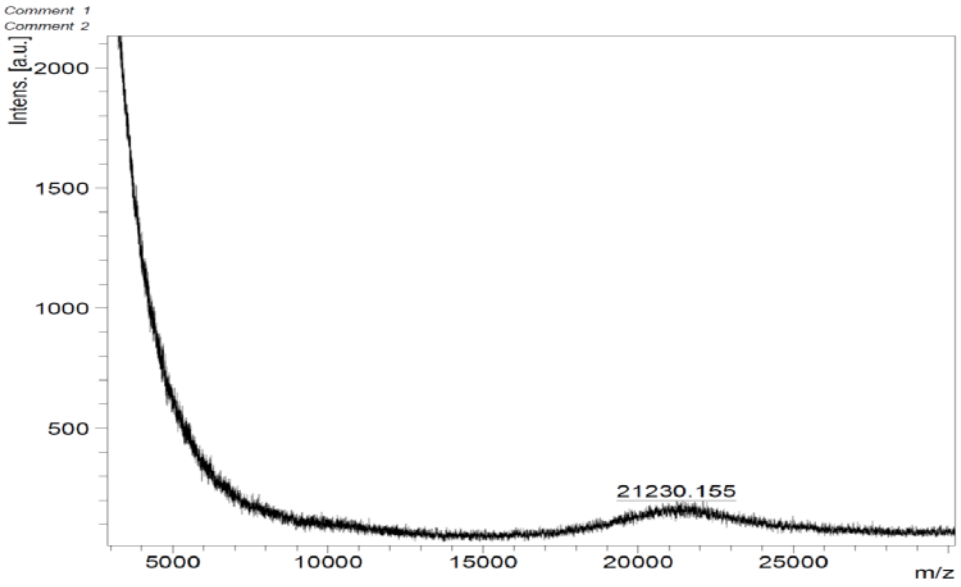


Figure S 36 MALDI-TOF MS spectra of dendrimer **6b**.

(G:4)-*dendri*-PAMAM-(NHAc)$_{20}$-(CPBA)$_{40}$ **(6c)**

The procedure used to synthesize **6a** was applied to synthesized **6c** (63.6 mg, 55 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.80 (br s, 160H), 3.51 (m, 460H), 3.40 (m, 178H), 3.26 (m, 98H), 2.88 (m, 108H), 2.79 (m, 152H), 1.97 (s, 60H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.6, 172.6, 170.3, 138.7, 136.7, 135.1, 127.5, 53.7, 51.3, 40.4, 39.8, 35.8, 30.1, 23.1; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 24.5

Mass (MALDI, m/z, SA: **6c**=20:1): Calculated for $C_{922}H_{1548}B_{40}N_{250}O_{264}K_1$ $[M+K]^+$: 21013. Found: 21013 $[M+K]^+$, PDI :1.17

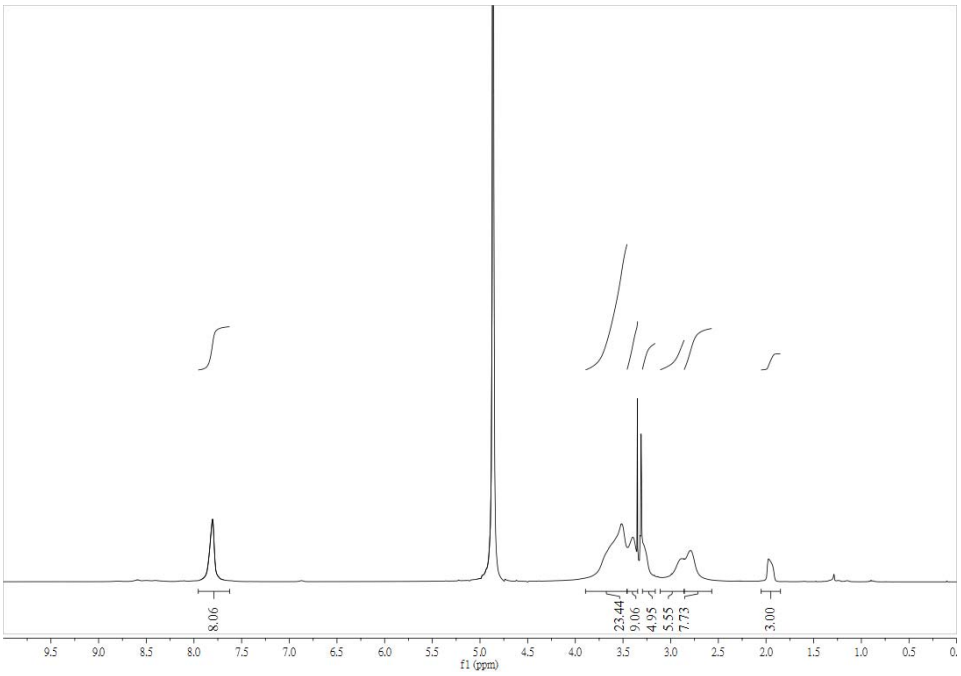


Figure S 37 ^{1}H NMR spectra of dendrimer **6c**.

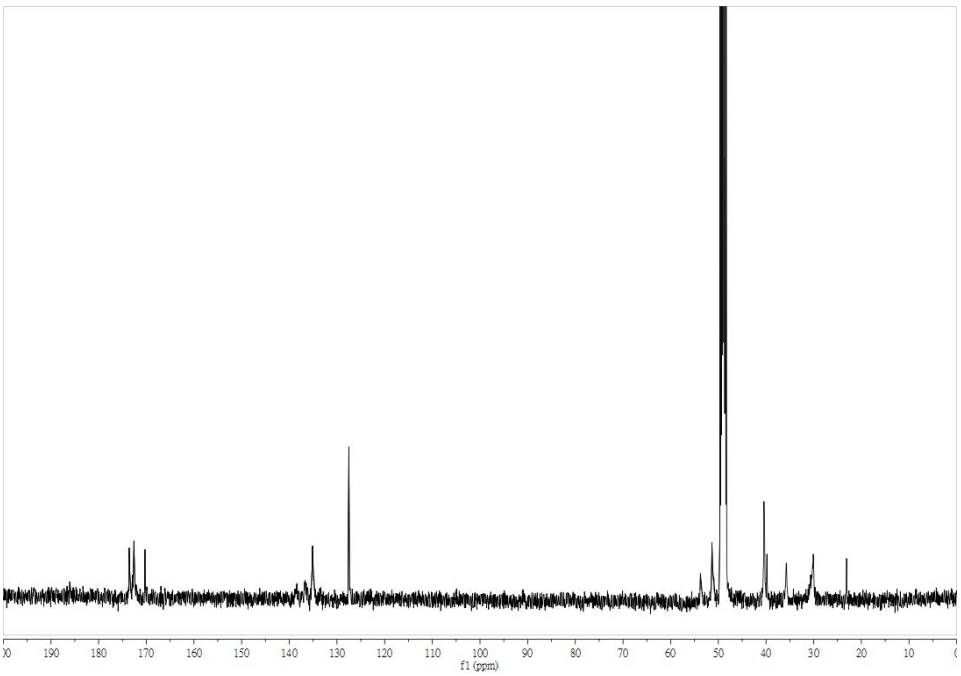


Figure S 38 ^{13}C NMR spectra of dendrimer **6c**.

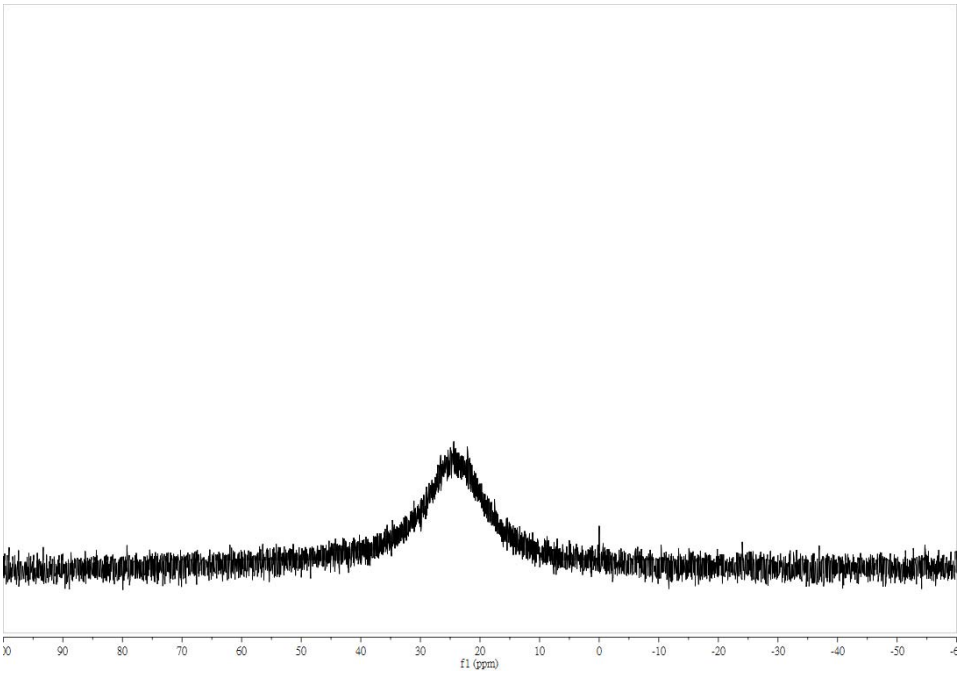


Figure S 39 ^{11}B NMR spectra of dendrimer **6c**.

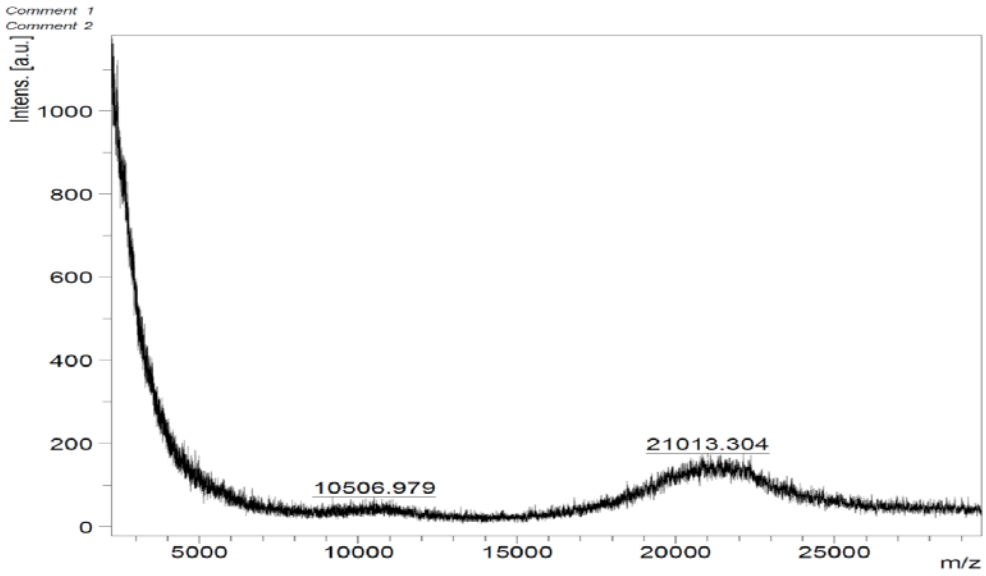


Figure S 40 MALDI-TOF MS spectra of dendrimer **6c**.

(G:4)-*dendri*-PAMAM-(NHAc)$_{44}$-(CPBA)$_{18}$ **(6d)**

The procedure used to synthesize **6a** was applied to synthesized **6d** (53.1 mg, 48 %). ^{1}H NMR (400 MHz, CD_3OD, ppm) δ : 7.83 (s, 72H), 3.65 (m, 160H), 3.51 (m, 244H), 3.32 (m, 164H), 3.29 (m, 162H), 2.85 (m, 110H), 2.77 (m, 156H), 1.97 (s, 132H); ^{13}C NMR (100 MHz, CD_3OD, ppm) δ: 173.6, 172.7, 170.3, 138.7, 136.8, 135.1, 127.5, 53.8, 51.4, 40.3, 39.9, 36.0, 30.7, 30.4, 23.1; ^{11}B NMR (133 MHz, CD_3OD, ppm) δ : 27.5

Mass (MALDI, m/z, SA: **6d**=20:1): Calculated for $C_{829}H_{1482}B_{17}N_{250}O_{219}Na_1$ $[M+Na]^+$: 18603. Found: 18603, PDI :1.19

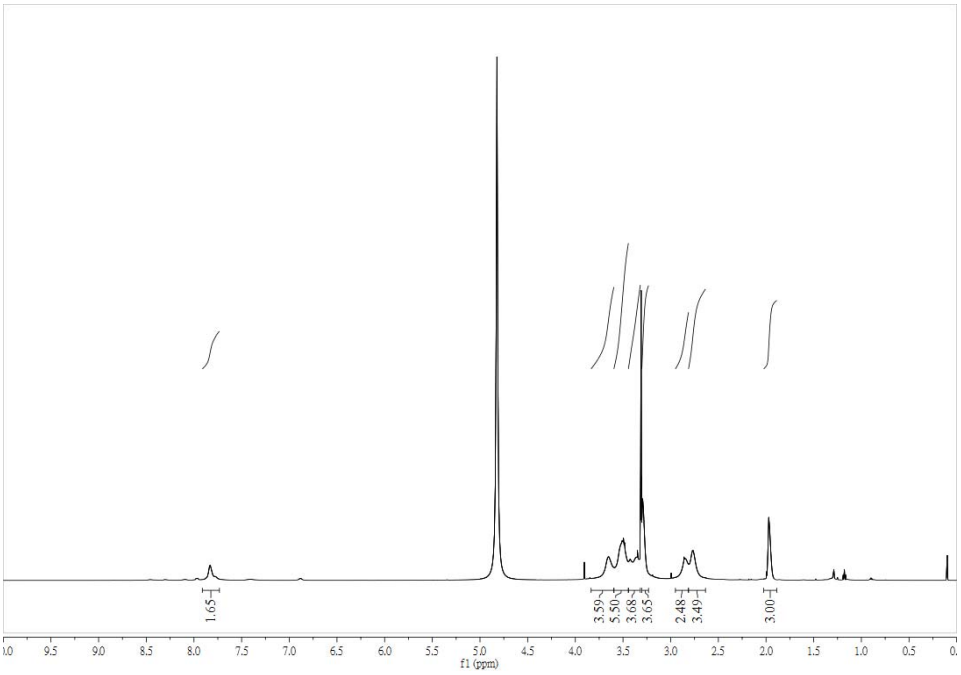


Figure S 41 ^{1}H NMR spectra of dendrimer **6d**.

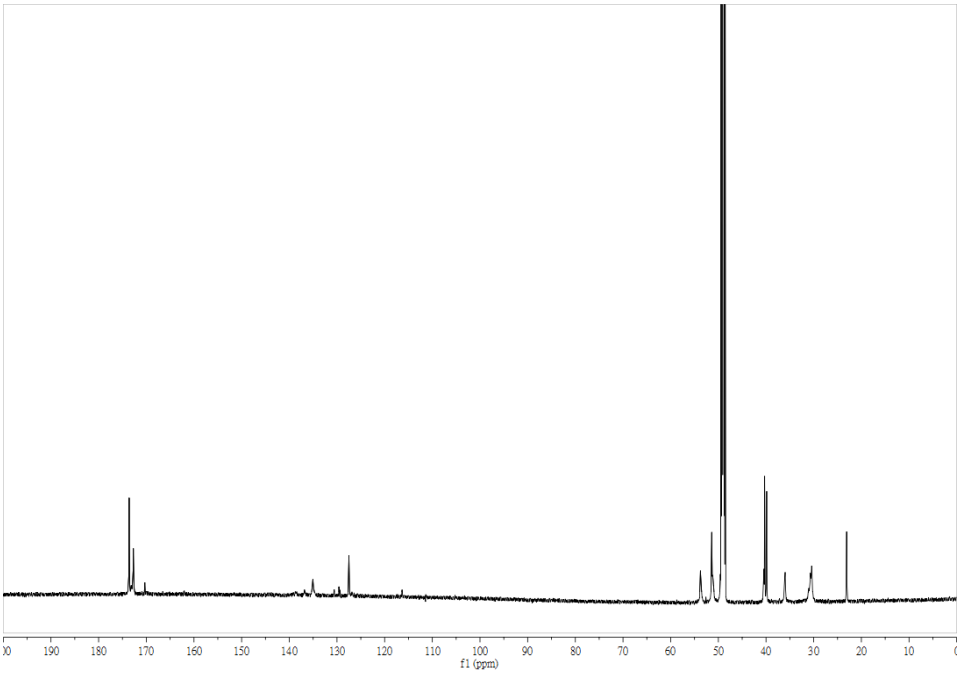


Figure S 42 ^{13}C NMR spectra of dendrimer **6d**.

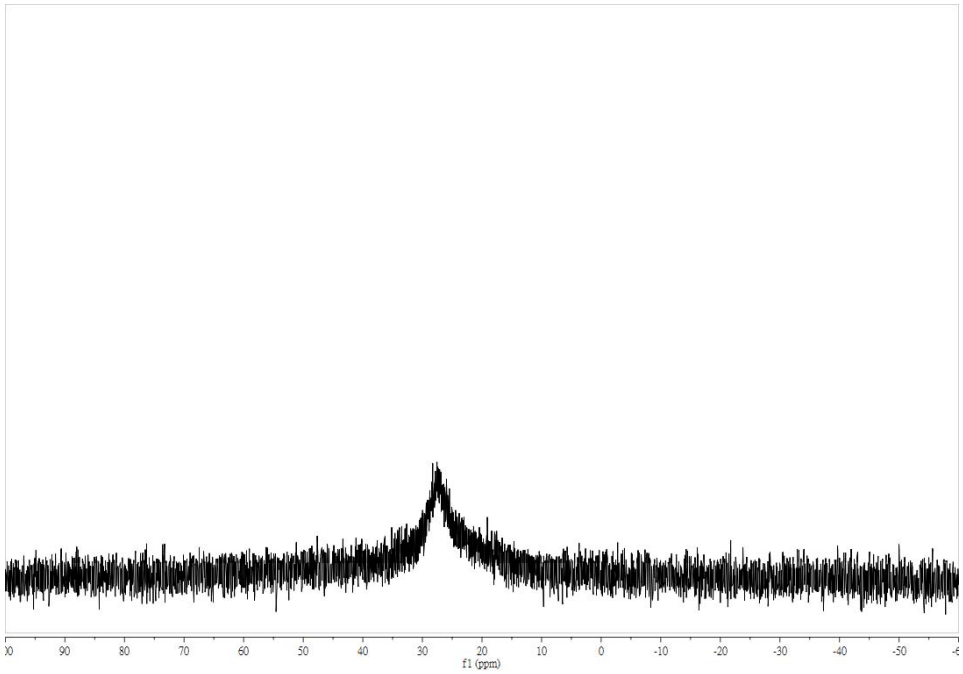


Figure S 43 ^{11}B NMR spectra of dendrimer **6d**.

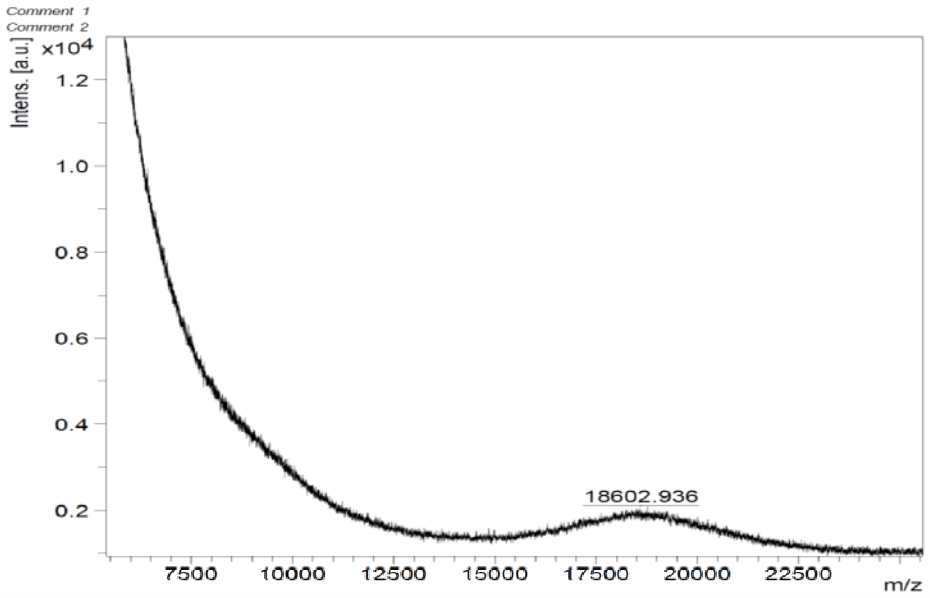
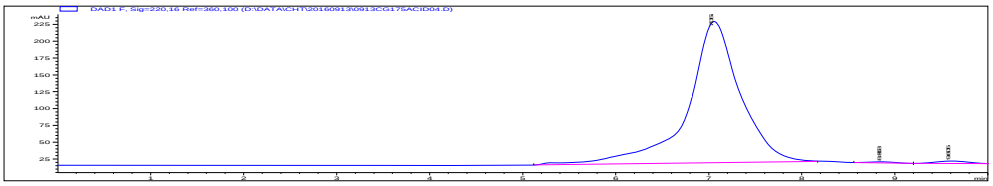


Figure S 44 MALDI-TOF MS spectra of dendrimer **6d**.

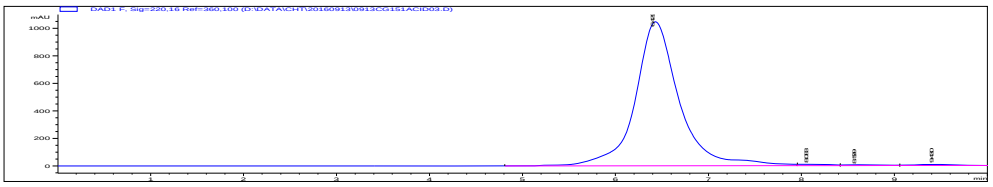
Gel Permeation Chromatography.

GPC traces for dendrimer **1a-1e, 6a-6d** in TSK G2000SW column (7.5 x 300 mm, 10 μm size) in Agilent HPLC system (1100 series). The experiments were conducted at 25ºC at a flow rate of 1 mL/min with 50% methanol and 50% water with 0.1 % TFA as eluent and detected at 220 nm. The results of filtration were followed with the figures that **1a** (7.06 min), and **1b** (6.43 min), and **1c** (5.98 min), and **1d** (5.69 min), and **1e** (5.28 min), and **6a** (5.95 min), and **6b** (5.89 min), and **6c** (5.93 min), and **6d** (5.97 min) are discovered. The PDI value were calculated using (G:2-6)-*dendri*-PAMAM-$(NH_2)_n$ as standard.

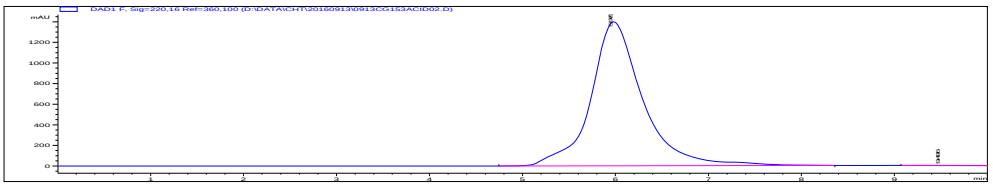
a.)



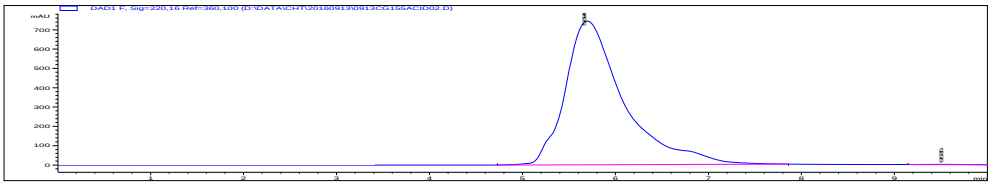
b.)



c.)



d.)



e.)

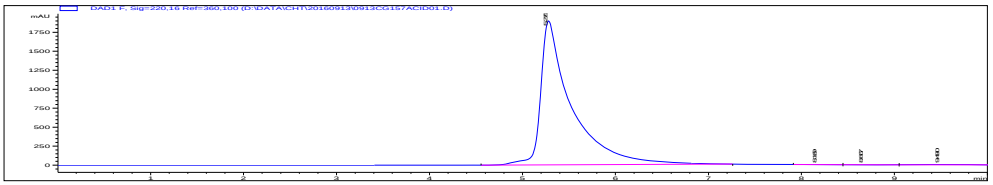
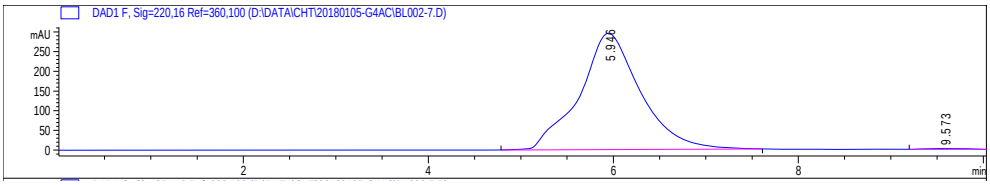
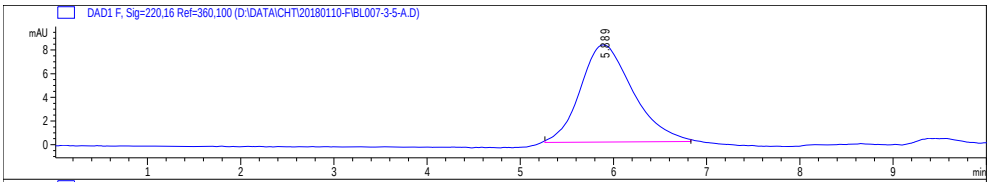


Figure S 45 GPC traces for dendrimers a.) **1a** b.) **1b** c.) **1c** d.) **1d** e.)**1e**.

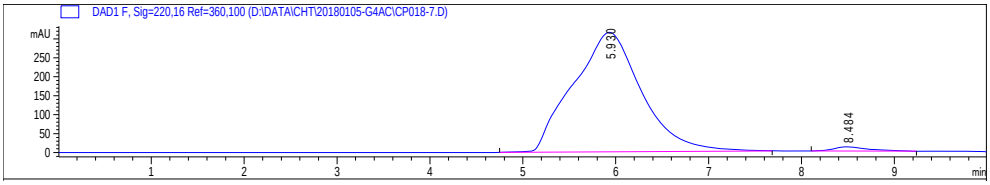
a.)



b.)



c.)



d.)

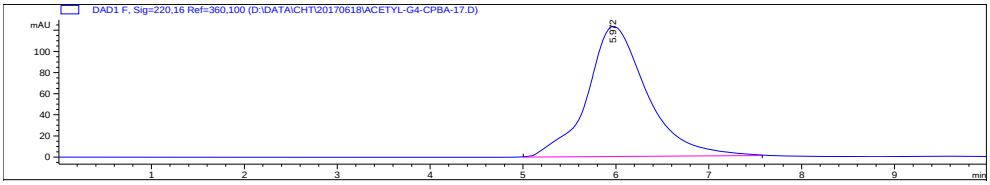


Figure S 46 GPC traces for dendrimers a.) **6a** b.) **6b** c.) **6c** d.) **6d.**

Measurement of binding constant

***K_b of ARS in the solution of* 40% Ethanol in 30 mM PBS (pH 4.96 and 7.50)**

An 83.2 μM solution of ARS in 50% Ethanol in 40 mM PBS (pH 5.92 and 7.60) as solution A. An 83.2 μM solution of **1b** was prepared in 50% Ethanol in 40 mM PBS (pH 5.92 and 7.60) as solution B. A 0.25 mL of solution A (83.2 μM) was added 0.25 mL solvent to obtain 0.5 mL ARS (41.6 μM) in cuvette for fluorescence measurement. 0.25 mL of solution B (83.2 μM) was added 0.25 mL solvent to obtain 0.5 mL **1b** (41.6 μM) in cuvette for fluorescence measurement. 0.25 mL of solution B (83.2 μM) was added 0.25 mL of solution A to obtain 0.5 mL ARS-**1b** (41.6 μM) in cuvette for fluorescence measurement.

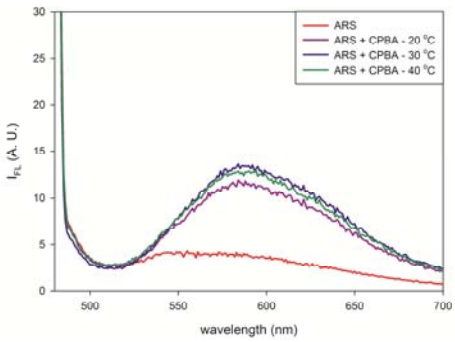
***K_b of ARS in* DMF**

An 83.2 μM solution of ARS in DMF as solution A. An 83.2 μM solution of **1b** was prepared in DMF (with 10% MeOH) as solution B. A 0.25 mL of solution A (83.2 μM) was added 0.25 mL solvent to obtain 0.5 mL ARS (41.6 μM) in cuvette for fluorescence measurement. 0.25 mL of solution B (83.2 μM) was added 0.25 mL solvent to obtain 0.5 mL **1b** (41.6 μM) in cuvette for fluorescence measurement. 0.25 mL of solution B (83.2 μM) was added 0.25 mL of solution A to obtain 0.5 mL ARS-**1b** (41.6 μM) in cuvette for fluorescence measurement.

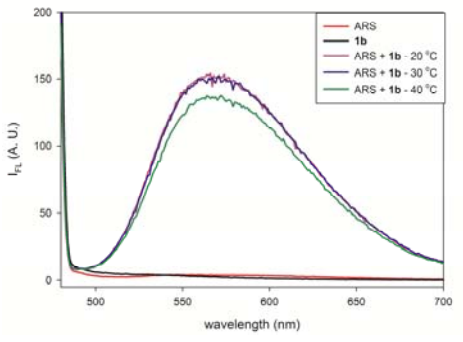
K_b of ARS at various temperature

An 83.2 μM solution of ARS in DMF as solution A. A 832 μM solution of **1b** was prepared in DMF (with 10% MeOH) as solution B. A 300 μM solution of CPBA was prepared in DMF (with 2.5% MeOH) as solution C. 0.25 mL of solution B (832 μM) was added 0.25 mL solvent A to obtain 0.5 mL ARS-**1b** (41.6 μM ARS, 416 μM **1b**) in cuvette for fluorescence measurement. 0.25 mL of solution C (300 μM) was added 0.25 mL solvent A to obtain 0.5 mL ARS-CPBA (150 μM) in cuvette for fluorescence measurement. (Figure S 47)

a.)



b.)



c.)

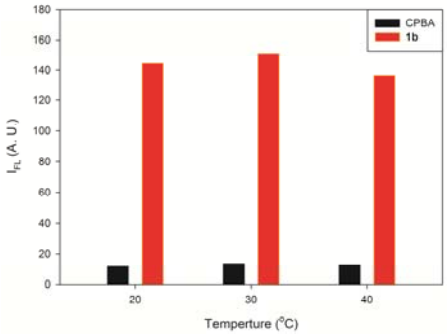


Figure S 47 Fluorescence intensity of ARS (150 μM for CPBA, 416 μM for **1b** in DMF, λ_{ex} = 468 nm) titrated with a.) CPBA (150 μM) b.) **1b** (416 μM) c.) Plot of intensity (λ_{en} = 585 nm for CPBA or 565 nm for **1b**) against temperature.

The binding constant of 1a-1e, 6a-6b with ARS

83.2 μM solution of ARS in DMF as solution A. 2.08-104.0 μM solution of **1a-1e**, ***6a-6b*** was prepared in DMF (with 10% MeOH) as solution B. 0.25 mL of solution A (83.2 μM) was added 0.25 mL solvent to obtain 0.5 mL ARS (41.6 μM) in cuvette for fluorescence measurement. 0.25 mL of solution B (83.2 μM) was added 0.25 mL solvent to obtain 0.5 mL **1a-1e**, ***6a-6b*** (41.6 μM) in cuvette for fluorescence measurement. 0.25 mL of solution B (83.2 μM) was added 0.25 mL of solution A to obtain 0.5 mL ARS-(**1a-1e**, ***6a-6b***) (41.6 μM) in cuvette for fluorescence measurement. The experiments were conducted at bandwidth in 10 (nm) and PMT med environment. The excitation wavelength was set at 468 nm. The intensity of the emission was recorded at 565 nm upon ARS mixture with dendrimer **1a-1e**, ***6a-6b***. The fluorescence spectra result of **1a-1e**, ***6a-6b*** with ARS fit to Besesi-Hildebrand equation to give the binding constant.

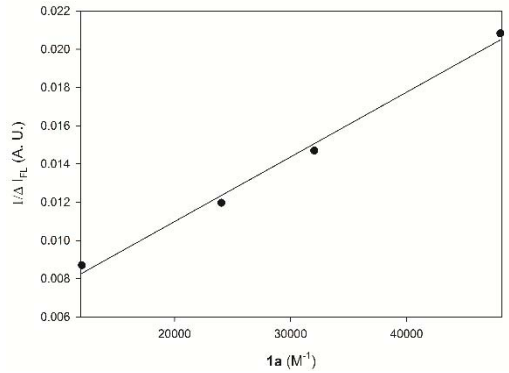
Besesi-Hildebrand equation:

$$\frac{1}{\Delta I_f} = \frac{1}{\Delta k_{p0} I_0 K_{eq1}} \frac{1}{[L]} + \frac{1}{\Delta k_{p0} I_0} \qquad (\text{eq. 1})$$

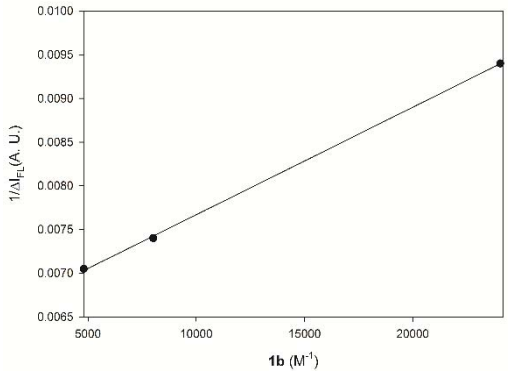
$$\frac{[S_0]}{P} = \frac{K_{eq1}}{K_{eq}} Q + 1 \qquad (\text{eq. 2})$$

$$P = [L_0] - \frac{1}{QK_{eq1}} - \frac{[I_0]}{(Q+1)} \qquad (\text{eq. 3})$$

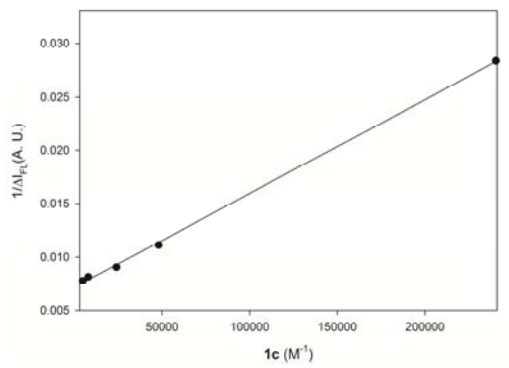
a.)



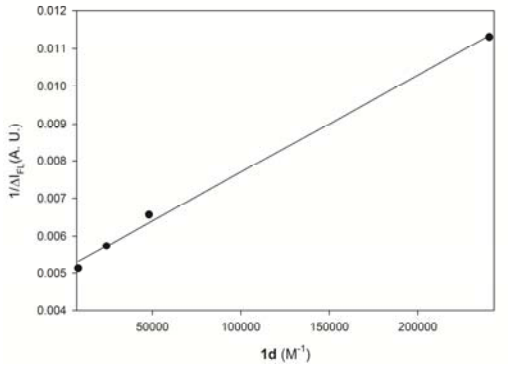
b.)



c.)

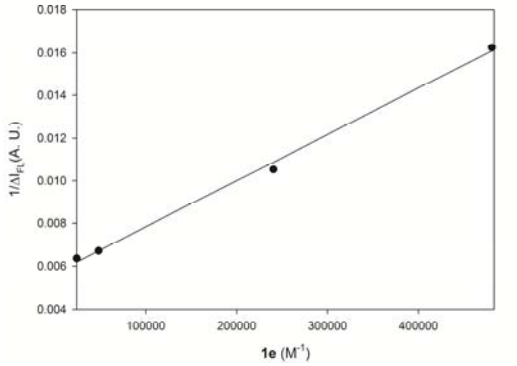


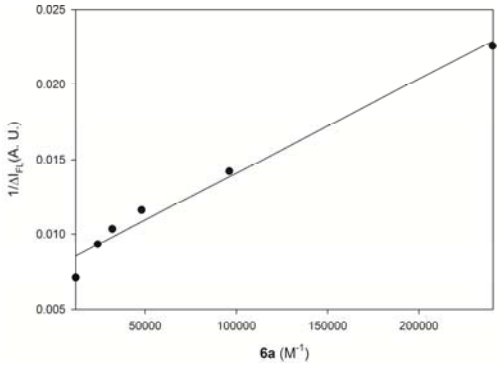
d.)



e.)

f.)





g.)

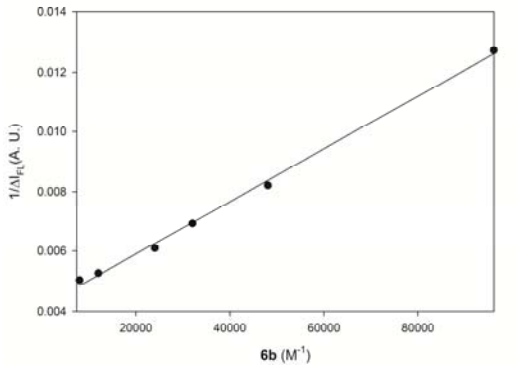


Figure S 48 Binding constant of ARS with a.) **1a**. b.) **1b**. c.) **1c**. d.) **1d**. e.) **1e**. f.) **6a**. g.) **6b**. The binding constant studies are in ARS (41.6 μM) with various concentration of boronic acid modified PAMAM dendrimers in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30°C).

The binding constant of CPBA to glucose

A 166.4 μM solution of ARS in DMF as solution A. A 4992 μM solution of CPBA was prepared in DMF as solution B. An 832-83200 μM solution of saccharides was prepared in DMF as solution C. 0.125 mL of solution A (166.4 μM) was added 0.375 mL solvent to obtain 0.5 mL ARS (41.6 μM) in cuvette for fluorescence measurement. 0.125 mL of solution B (4992 μM) was added 0.375 mL solvent to obtain 0.5 mL CPBA (41.6 μM) in cuvette for fluorescence measurement. 0.125 mL of solution A (166.4 μM) and 0.125 mL of solution B (4992 μM) was added into solvent (0.25 mL) to obtain 0.5 mL mixture solution ARS- CPBA (41.6 μM ARS, 1248 μM CPBA). 0.125 mL solution B was added into solution C (0.25 mL) in order to make mixture solution BC, and stand for 30 min. Then 0.125 mL solution A was added into mixture solution BC (0.375 mL) to obtain 0.5 mL mixture solution ABC. A 0.5 mL of the mixture ABC was transferred into a cuvette for fluorescence measurement. The experiments were conducted at bandwidth in 10 (nm) and PMT med environment. he fluorescence spectra result of CPBA with glucose fit to Besesi-Hildebrand equation to give the binding constant.

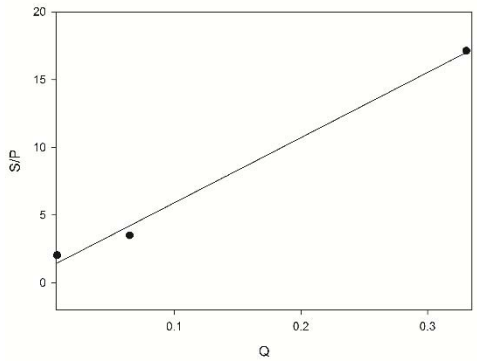


Figure S 49 Binding constant of CPBA with glucose. The binding constant studies are in CPBA (1248 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30ºC).

The binding constant of 1a-1e, 6a-6d to saccharides using fluorescence spectra

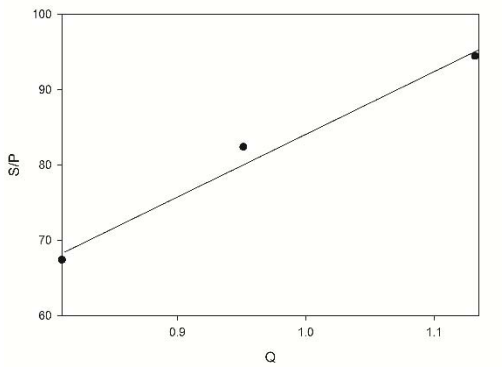
Dendrimer 1a-1e, **6a-6d** ***with glucose, 1a with galactose, lactose, and fructose***

A 166.4 μM solution of ARS in DMF as solution A. A 166.4 μM solution of boronic acid-modified PAMAM dendrimer (**1a-1e**, **6a-6d**) was prepared in DMF (with 10% MeOH) as solution B. An 832-83200 μM solution of saccharides was prepared in DMF as solution C. 0.125 mL of solution A (166.4 μM) was added 0.375 mL solvent to obtain 0.5 mL ARS (41.6 μM) in cuvette for fluorescence measurement. 0.125 mL of solution B (166.4 μM) was added 0.375 mL solvent to obtain 0.5 mL dendrimer **1a-1e**, **6a-6d** (41.6 μM) in cuvette for fluorescence measurement. 0.125 mL of solution A (166.4 μM) and 0.125 mL of solution B (166.4 μM) was added into solvent (0.25 mL) to obtain 0.5 mL mixture solution ARS-(**1a-1e**, **6a-6d**) (41.6 μM). 0.125 mL solution B was added into solution C (0.25 mL) in order to make mixture solution BC, and stand for 30 min. Then 0.125 mL solution A was added into mixture solution BC (0.375 mL) to obtain 0.5 mL mixture solution ABC. A 0.5 mL of the mixture ABC was transferred into a cuvette for fluorescence measurement. The experiments were conducted at bandwidth in 10 (nm) and PMT med environment. The fluorescence spectra result of **1a-1e**, **6a-6b** with saccharides fit to Besesi-Hildebrand equation to give the binding constant.

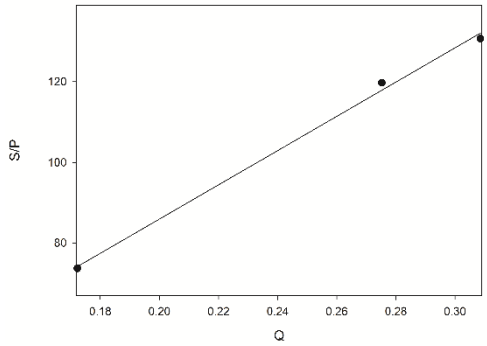
Dendrimer 1b-1e with galactose, lactose, and fructose

A 2500 μM solution of ARS in DMF as solution A. A 2500 μM solution of boronic acid-modified PAMAM dendrimer (**1a-1e**) was prepared in DMF (with 10% MeOH) as solution B. An 100-200000 μM solution of saccharides was prepared in DMF as solution C. 2 μL of solution A (2500 μM) was added 0.5 mL solvent to obtain 0.5 mL ARS (10.0 μM) in cuvette for fluorescence measurement. 2 μL of solution B (2500 μM) was added 0.5 mL solvent to obtain 0.5 mL dendrimer **1a-1e** (10 μM) in cuvette for fluorescence measurement. 2 μL solution A (5000 μM) and 2 μL solution B (5000 μM) was added into solvent (0.5 mL) to obtain 0.5 mL mixture solution AB (10 μM). 2 μL solution B was added into solution C (0.5 mL) in order to make mixture solution BC, and stand for 30 min. Then 2 μL solution A was added into mixture solution BC (0.5 mL) to obtain 0.5 mL mixture solution ABC. A 0.5 mL of the mixture ABC was transferred into a cuvette for fluorescence measurement. The experiments were conducted at bandwidth in 10 (nm) and PMT med environment. he fluorescence spectra result of **1a-1e** with saccharides fit to Besesi-Hildebrand equation to give the binding constant.

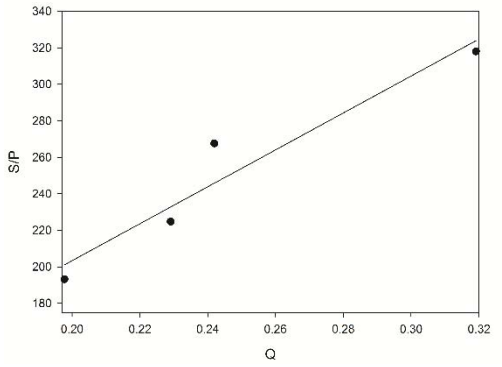
a.)



b.)



c.)



d.)

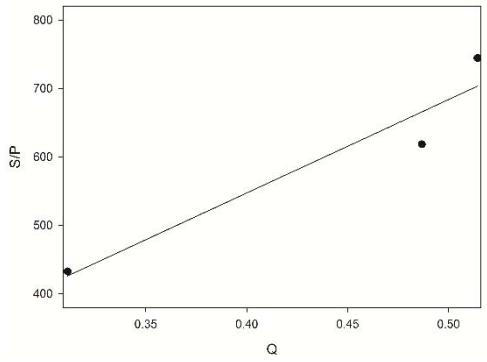
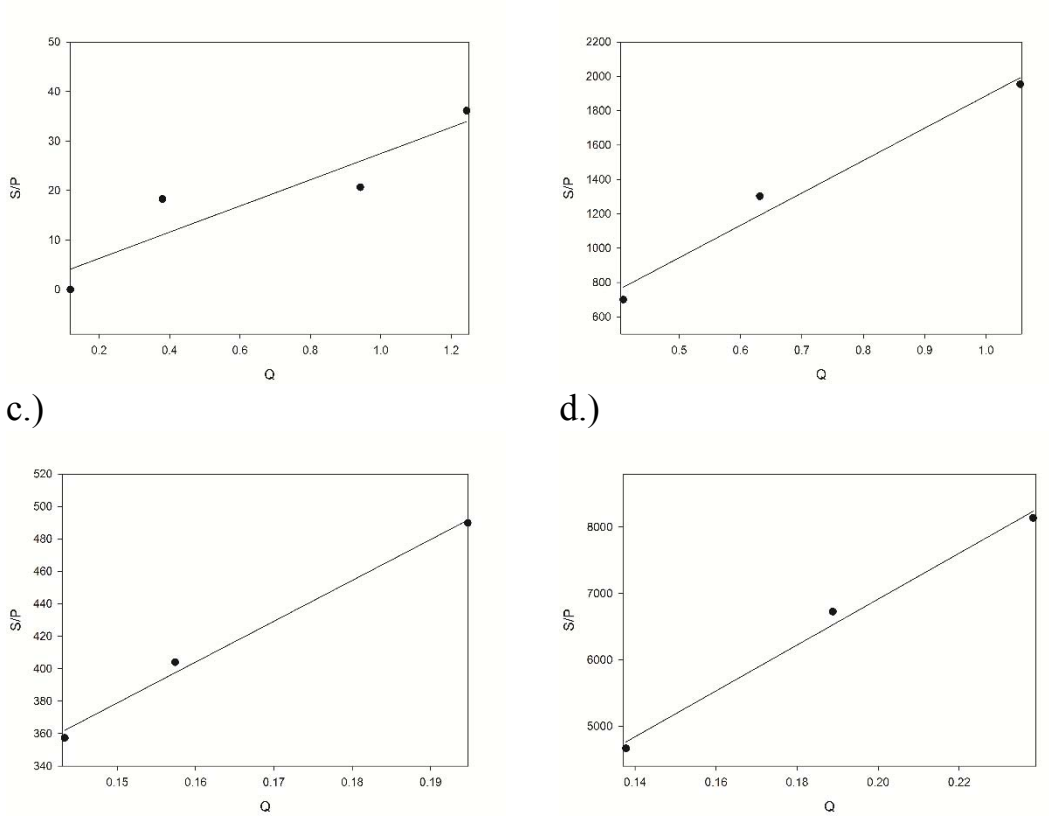


Figure S 50 Binding constant of **1a** with a.) **2**. b.) **3**. c.) **4**. d.) **5**. The binding constant studies are in **1a** (41.6 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30°C).

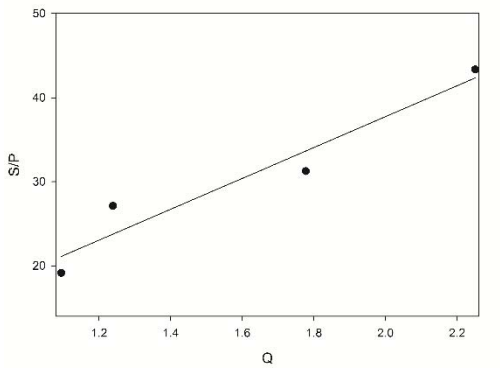
a.) b.)



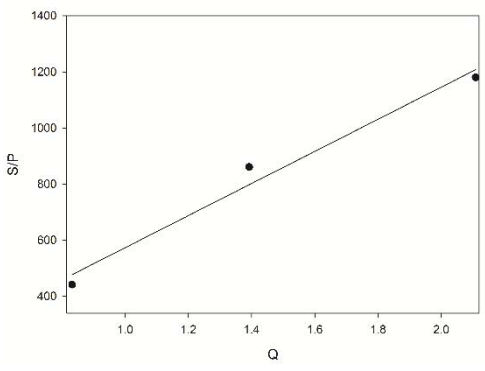
c.) d.)

Figure S 51 Binding constant of **1b** with a.) **2**. b.) **3**. c.) **4**. d.) **5**. The binding constant studies are in **1b** (41.6 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30°C).

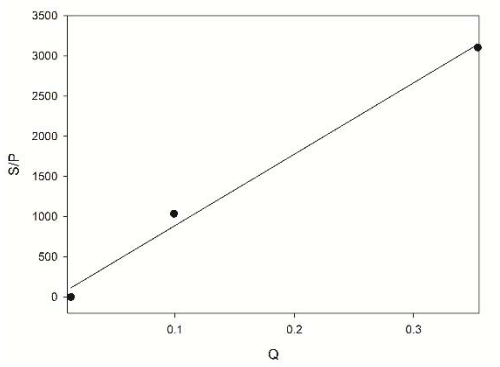
a.)



b.)



c.)



d.)

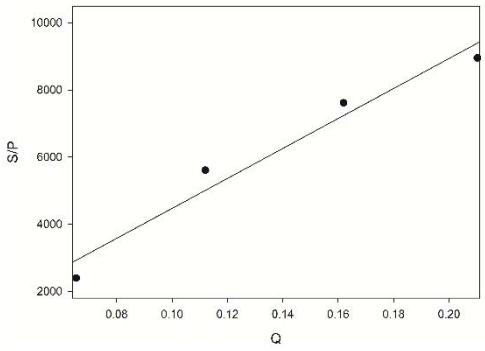
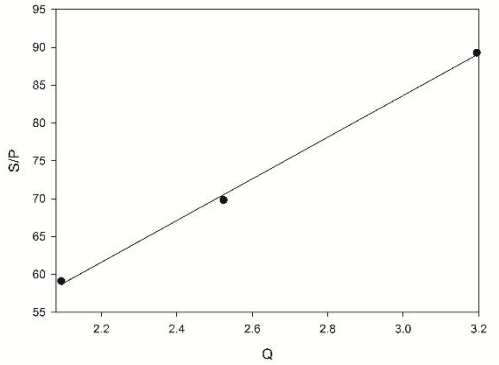
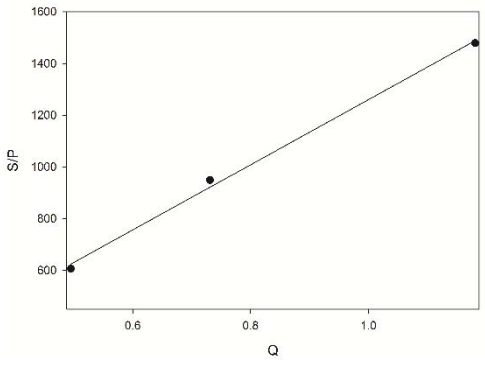


Figure S 52 Binding constant of **1c** with a.) **2**. b.) **3**. c.) **4**. d.) **5**. The binding constant studies are in **1c** (41.6 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30ºC).

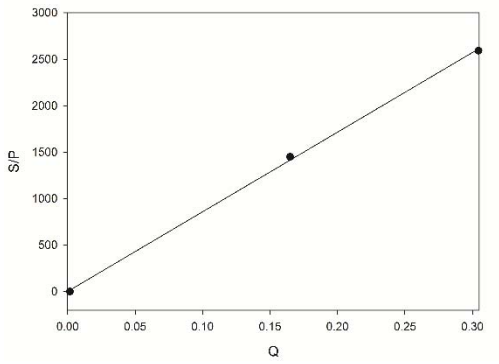
a.)



b.)



c.)



d.)

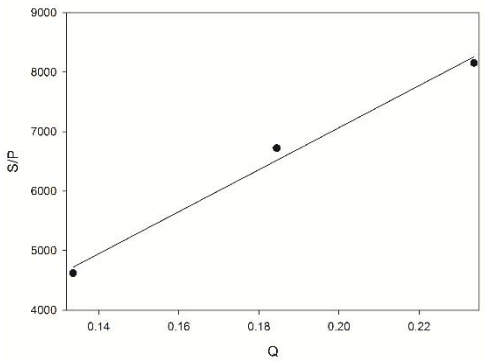
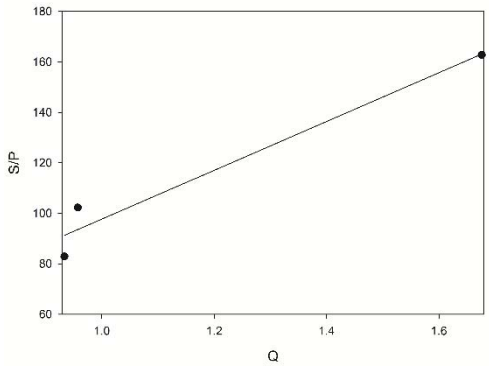
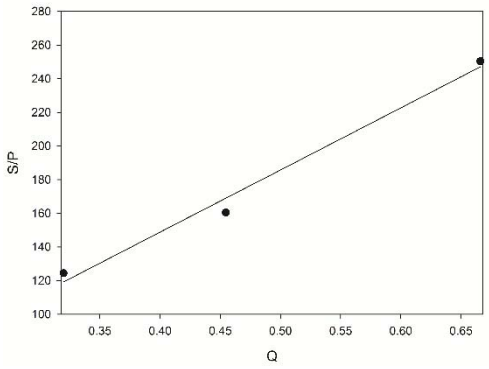


Figure S 53 Binding constant of **1d** with a.) **2**. b.) **3**. c.) **4**. d.) **5**. The binding constant studies are in **1d** (41.6 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30ºC).

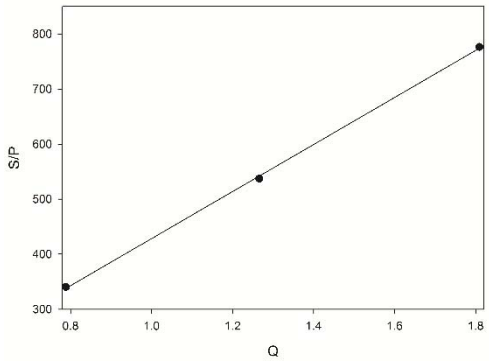
a.)



b.)



c.)



d.)

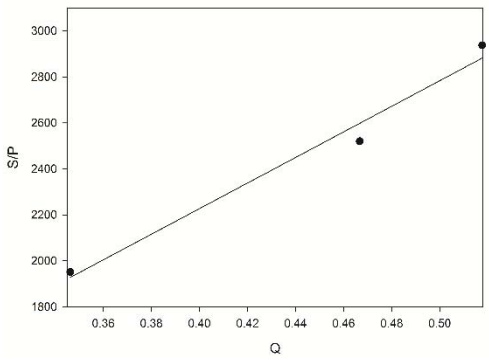


Figure S 54 Binding constant of **1e** with a.) **2**. a.) **3**. a.) **4**. a.) **5**. The binding constant studies are in **1e** (41.6 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30ºC).

a.) b.)

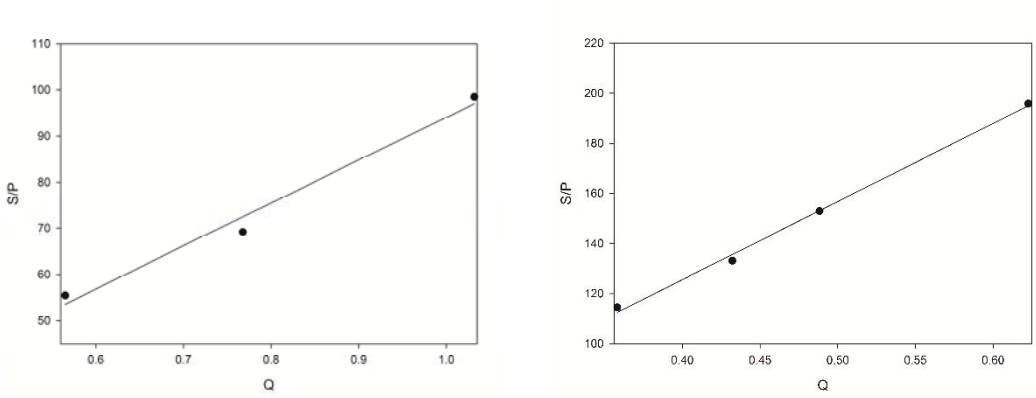


Figure S 55 Binding constant of a.) **6a**. b.) **6b**. with **2**. The binding constant studies are in **6a-6b** (41.6 μM) with various concentration of **2** in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30°C).

a.) b.)

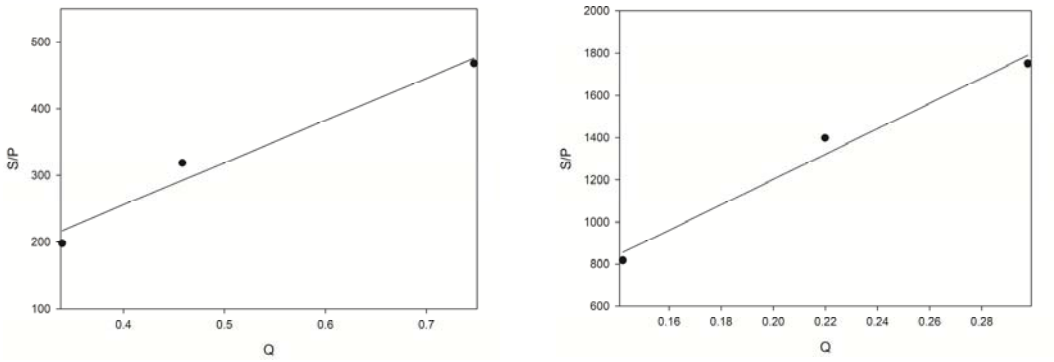


Figure S 56 Binding constant of **1c** with a.) **8**. b.) **9**. The binding constant studies are in **1c** (41.6 μM) with various concentration of saccharides in 2.5% MeOH in DMF (λ_{ex} = 468 nm, λ_{em} = 565 nm, 30°C).

Table S1. Binding constant (M^{-1}) of **1a-1e** with ARS / saccharides.

	ARS		**2**		**3**		**4**		**5**	
$K_b(M^{-1})$	$K_{ARS\text{-}DBA}$[a]	$K_{ARS\text{-}BA}$[b]	$K_{Glc\text{-}DBA}$[a]	$K_{Glc\text{-}BA}$[b]	$K_{Gala\text{-}DBA}$[a]	$K_{Gala\text{-}BA}$[b]	$K_{Fru\text{-}DBA}$[a]	$K_{Fru\text{-}BA}$[b]	$K_{Lac\text{-}DBA}$[a]	$K_{Lac\text{-}BA}$[b]
1a	12389	880	148.6	10.6	29.2	2.1	12.2	0.9	9.1	0.7
1b	52032	1730	1963.5	65.5	27.6	0.9	20.7	0.7	1.5	0.05
1c	80000	1380	4205.9	72.5	135.2	2.3	8.7	0.2	1.7	0.03
1d	166700	1400	6039.8	50.7	132.4	1.1	19.5	0.2	4.7	0.04
1e	285000	1400	2947.7	14.5	771.5	3.8	666.9	3.3	51.2	0.3
PBA[c]	670		7.2		38		310		ND[d]	
CPBA[e]			13.9							

a: K_b was obtained based on the concentration of dendrimers **1** b: K_b was obtained based on the concentration of boronic acid of each dendrimers **1** c: 9 μM ARS with 2 mM PBA at pH 8.0 in 0.1 M phosphate buffer.[6] d : no detection e : the same concentration of boronic acid with **1b** in DMF (with 2.5% MeOH).