# *Electronic Supplementary Information*

## *Biodegradable Dendritic Polymersomes as Modular, High Relaxivity MRI Contrast Agents*

Ali Nazemi[a], Francisco Martínez[b], Timothy J. Scholl[b], and Elizabeth R. Gillies*[,a,c]

[a]Department of Chemistry, [b]Department of Medical Biophysics and the Robarts Research Institute, [c]Department of Chemical and Biochemical Engineering, Western University, 1151 Richmond St., London, Canada

**Table of Contents:**

**General Procedures and Materials**

Compound **9** was purchased from Macrocyclics (Dallas, USA). All the other chemicals were purchased from Sigma-Aldrich and were used without further purification unless otherwise noted. Anhydrous *N,N*-dimethylformamide (DMF) was obtained from a solvent purification system using aluminum oxide columns. Triethylamine ($NEt_3$) was distilled from calcium hydride ($CaH_2$). Ultrapure water was obtained from a Barnstead EASYpure II system. Unless otherwise stated, all reactions were performed under a nitrogen atmosphere using flame or oven dried glassware. Dialyses were performed using Spectra/Por regenerated cellulose membranes with either a 1000, 3500, or 50000 g/mol molecular weight cutoff (MWCO). $^{1}H$ NMR spectra were obtained at 400 MHz, and $^{13}C$ NMR spectra were obtained at 100 MHz. NMR chemical shifts are reported in ppm and are calibrated against the residual solvent signal of $CD_3OD$ (δ 3.31 and 50.41 ppm), or $(CD_3)_2SO$ (δ 2.50 and 40.45 ppm). Coupling constants (*J*) are expressed in Hertz (Hz). Infrared (IR) spectra were obtained as KBr pellets using a Bruker Tensor 27 instrument. High-resolution mass spectrometry (HRMS) was performed using a Finnigan MAT 8400 electron impact mass spectrometer. Dynamic light scattering (DLS) data were obtained using a Zetasizer NanoZS instrument from Malvern Instruments. The inductively coupled plasma mass spectrometry (ICP-MS) analysis was performed at the Environmental Analytical Laboratories of the Saskatchewan Research Council. Relaxation rate measurements were performed on a Stelar Spinmaster FFC2000 1T C/DC relaxometer at 298 and 310 K using 100 mM pH 7.4 phosphate buffer as solvent. Error measurements on the relaxivity are based on the combined uncertainties of the relaxometer measurements and the Gd(III) concentrations in the solutions.

**Synthesis of Dendron 10**

Dendron **8**[1] (49 mg, 22 μmol, 1.0 equiv.) and DTPA derivative **9** (0.11 g, 0.18 mmol, 8.0 equiv.) were dissolved in anhydrous DMF (2 mL) with sonication. Anhydrous $NEt_3$ (0.4 mL) was then added and the reaction mixture was stirred at room temperature overnight. An additional portion of **9** (0.11 g, 0.18 mmol, 8.0 equiv.) was added the next morning and the mixture was stirred for another 12 h at room temperature. Distilled water (1 mL) was then added to dissolve the resulting solid and the solution was dialyzed against distilled water (2 L) using a 3500 g/mol MWCO membrane for 24 h. The sample was lyophilized to provide dendron **10** as a light yellow fluffy solid (0.12 g, 73%). $^1$H NMR ($CD_3OD$): δ 7.54-7.35 (m, 16H), 7.32-7.19 (m, 16H), 4.79 (br s, 2H), 4.40-4.16 (m, 28H), 3.89-3.40 (m, 112H), 3.24-2.94 (m, 296H), 2.80-2.68 (m, 16H), 1.27 (t, 384H, J=8). $^{13}$C NMR ($CD_3OD$): δ 180.7, 174.6, 171.7, 169.9, 169.4, 158.4, 138.2, 129.3, 124.1, 123.6, 62.3, 57.2, 55.6, 54.3, 53.9, 53.8, 52.5, 45.8, 39.6, 38.6, 38.4, 37.8, 33.4, 32.0, 25.4, 24.7, 17.1, 17.0, 7.9. IR ($cm^{-1}$): 3444, 2976, 2939, 2678, 2495, 1740, 1628.

**Synthesis of Dendron 4**

Dendron **10** (30 mg, 3.9 μmol, 1.0 equiv.) was dissolved in ultrapure water (4 mL). Using 0.1 M NaOH (in ultrapure water), the pH of the dendron solution was carefully adjusted to 7.4. $GdCl_3.6H_2O$ (46 mg, 0.12mmol, 32 equiv.) was then added as a solution in ultrapure water. The pH of the solution was again adjusted to 7.4 using the 0.1M NaOH. The resulting solution was stirred at room temperature for 20 h. After this period of time, the mixture was transferred to a 1000 g/mol MWCO membrane and dialyzed against ultrapure water for 24 h. The sample was centrifuged at 5000 rpm for 30 min to remove any insoluble species. Finally, the sample was lyophilized to give the target dendron **4** as a fluffy white solid (19 mg, 65%). IR ($cm^{-1}$): 3421,

2924, 1735, 1602. $^{1}$H and $^{13}$C NMR of this compound could not be obtained because of paramagnetic Gd(III) ions. ICP-MS: mass of dendron analyzed: 2.4 mg; mass of Gd(III) expected: 0.43 mg; mass of Gd(III) found: 0.42 ± 0.01 mg. This suggests that all eight positions at the periphery of dendron **4** were functionalized with the DTPA derivative and these successfully chelated Gd(III).

**Synthesis of compound 11**

Compound **9** (21 mg, 33 µmol, 1.0 equiv.) and propargylamine hydrochloride (2.7 mg, 30 µmol, 0.90 equiv.) were dissolved in anhydrous DMF (0.5 mL) and anhydrous $NEt_3$ (0.4 mL). The mixture was stirred at room temperature overnight. The solvents were removed under reduced pressure and the obtained target molecule **11** was used without further purification (quantitative yield). $^{1}$H NMR (DMSO-$d_6$): δ 7.45 (d, 2H, J=8), 7.10 (d, 2H, J=8), 5.21 (d, 2H, J=16), 4.74 (s, 1H), 3.63 (br s, 2H), 3.52-3.18 (m, 12H), 3.12-2.91 (m, 5H), 2.88-2.75 (m, 5H), 2.47-2.40 (m, 1H), 1.18 (br s, 9H). $^{13}$C NMR (DMSO-$d_6$): δ 189.6, 162.7, 153.2, 132.2, 129.7, 118.6, 78.0, 77.6, 74.4, 45.6, 37.0, 31.2, 31.2, 28.5, 8.8. IR (cm$^{-1}$): 3422, 2978, 2676, 2495, 2125, 1637. HRMS: calcd $[M]^+$ ($C_{25}H_{33}N_5O_{10}SNa$): 618.1846 Found: (ESI) 618.1830.

**Synthesis of compound 5**

Compound **11** (23 mg, 21 µmol, 1.0 equiv.) was dissolved in ultrapure water (3 mL). Using 0.1 M NaOH (in ultrapure water) the pH of the solution was carefully adjusted to 7.4. $GdCl_3.6H_2O$ (12 mg, 31 µmol, 1.5 equiv.) was then added as a solution in ultrapure water. The pH of the solution was again adjusted to 7.4 using 0.1 M NaOH. The resulting solution was stirred at room temperature for 20 h. The sample was centrifuged at 5000 rpm for 30 min to remove any

insoluble species. Finally, the sample was lyophilized to give the target molecule **5** as a white solid (12 mg, 70%). IR ($cm^{-1}$): 3412, 2924, 1603. $^{1}H$ and $^{13}C$ NMR of this compound could not be obtained because of paramagnetic Gd (III) ions. ICP-MS: mass of sample analyzed: 0.51 mg; mass of Gd(III) expected: 0.10 mg; mass of Gd(III) found: 0.16 ± 0.01 mg. The higher amount of Gd(III) found for this sample was expected as no purification was performed on compound **5**. However, this is not problematic as the excess Gd(III) will subsequently be removed during dialysis of polymersomes **7**.

**Preparation of dendritic Gd(III)-functionalized polymersomes 6**

PCL-PEO polymersomes (2 mg/mL, 5 mL) containing an 80:20 ratio of methoxy-terminated PCL-PEO(**1**): azide terminated PCL-PEO-$N_3$(**2**) were prepared in ultrapure water as previously reported.[2] To the vesicle suspension was then added **4** (5.1 mg, 0.70 µmol, 4.0 equiv. relative to azide polymer) dissolved in minimal ultrapure water. Separately, $CuCl_2$. $2H_2O$ (0.34 mg, 2.0 µmol, 2.3 equiv. relative to total polymer) and bathophenanthrolinedisulfonic acid (2.4 mg, 4.0 µmol, 4.6 equiv. relative to total polymer) were combined in ultrapure water (0.2 mL) for 15 min. and then the resulting complex was added to the vesicle suspension followed by addition of sodium ascorbate (4.0 mg, 20 µmol, 23 equiv. relative to total polymer). The resulting mixture was stirred at room temperature for 18 h and then dialyzed against phosphate buffer (0.10 M, pH 7.4) for 24 h using a 50000 g/mol MWCO dialysis membrane. ICP-MS of the sample prepared for relaxivity measurement: mass of Gd(III) expected for 100% functionalization of **2**: 220 µg; mass of Gd(III) found: 83 ± 4 µg, which corresponds to 38% functionalization of polymer **2** in the polymersomes with dendron **4**. To exclude the possibility of the presence of free Gd(III), the Xylenol orange test[3] was performed and it was found that less than 0.01% of the Gd(III) present

was unchelated. Moreover, ICP-MS results showed that > 94% of the copper used for reaction was successfully removed by dialysis.

**Preparation of non-dendritic Gd(III)-functionalized polymersomes 7**

PCL-PEO polymersomes (2 mg/mL, 5 mL) containing a 50:50 ratio of methoxy-terminated PCL-PEO (**1**): azide terminated PCL-PEO-$N_3$(**2**) were prepared in ultrapure water as previously reported.[2] To the vesicle suspension was then added **5** (1.4 mg, 1.7 μmol, 4.0 equiv. relative to azide polymer) dissolved in minimal ultrapure water. Separately, $CuCl_2$. $2H_2O$ (0.34 mg, 2.0 μmol, 2.3 equiv. relative to total polymer) and bathophenanthrolinedisulfonic acid (2.4 mg, 4.0 μmol, 4.6 equiv. relative to total polymer) were combined in ultrapure water (0.2 mL) for 15 min. and then the resulting complex was added to the vesicle suspension followed by the addition of sodium ascorbate (4.0 mg, 20 μmol, 23 equiv. relative to total polymer). The resulting mixture was stirred at room temperature for 18 h and then dialyzed against phosphate buffer (0.10 M, pH 7.4) for 24 h using a 50000 g/mol MWCO dialysis membrane. ICP-MS of the sample prepared for relaxivity measurement: mass of Gd(III) expected for 100% functionalization of **2**: 68 μg; mass of Gd(III) found: 18 ± 1 μg, which corresponds to 26% functionalization of polymer **2** in the polymersomes with compound **5**. The Xylenol orange test showed that only 0.06% of the of the Gd(III) present was unchelated. In addition, ICP-MS results confirmed successful removal of more than 97% of the copper used for the reaction by dialysis.

*Note: The reason why a different composition of **1**:**2** was used for polymersome formation here than for polymersomes **6** is to account for the higher loading of Gd(III) that was introduced by

each dendron **4**, because each dendron can potentially introduce eight Gd(III) ions while each of molecule **5** can only introduce one Gd(III) ion.

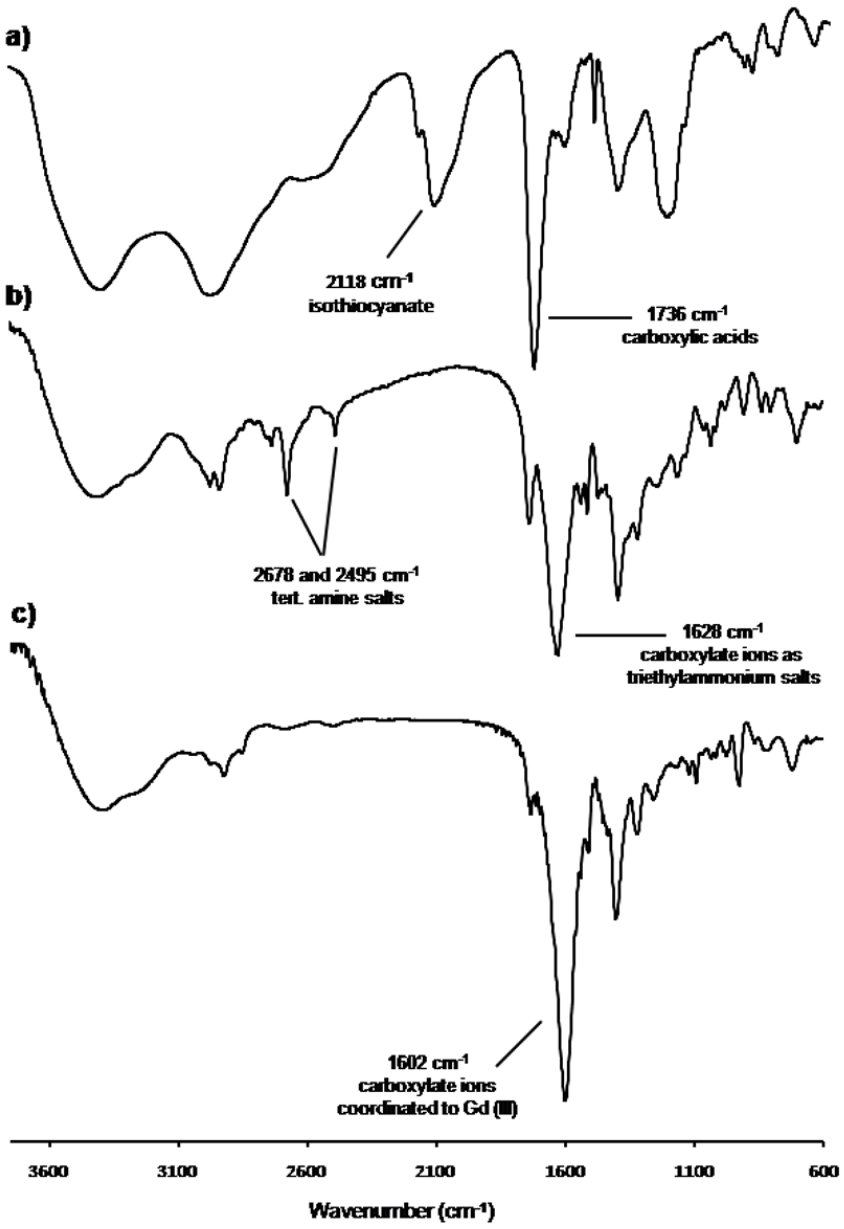


**Figure S1.** IR spectra for: a) DTPA derivative **9**; b) dendron **10**; c) dendron **4**

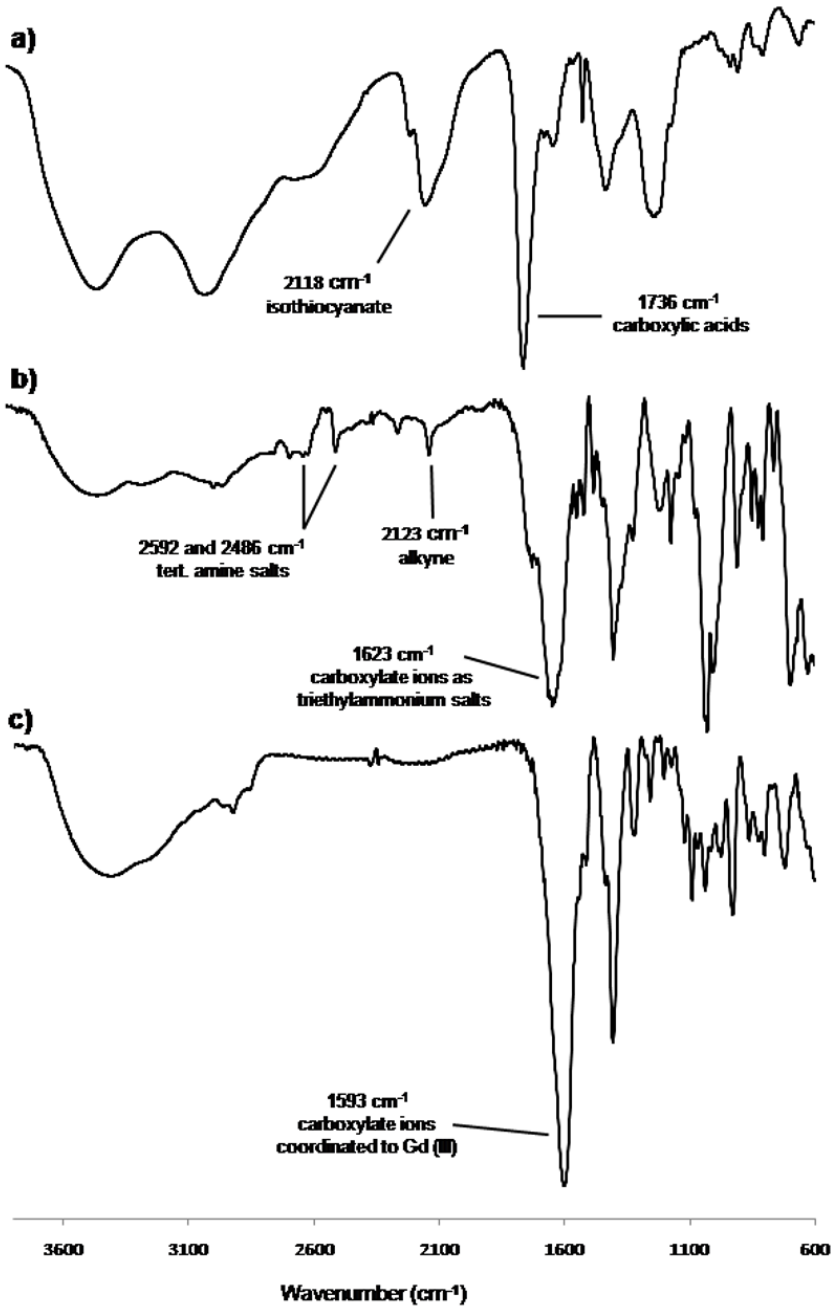


**Figure S2.** IR spectra for: a) DTPA derivative **9**; b) compound **11**; c) compound **5**

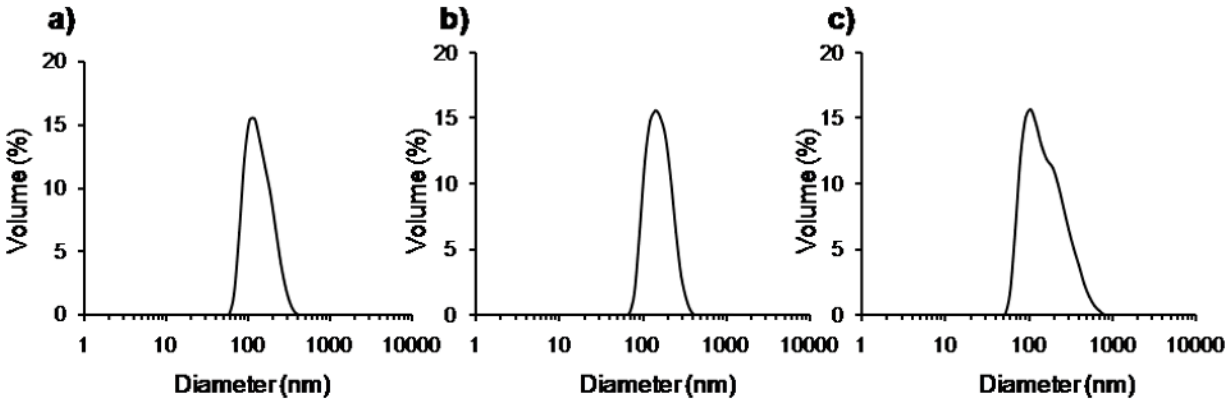


**Figure S3.** Size distribution profiles for: a) naked polymersome **3**; non-dendritic polymersome **7**; c) dendritic polymersome **6**. The shoulder observed for polymersomes **6** suggests the existence of a small degree of aggregation upon conjugation of the dendron **4** to the polymersome surfaces.

**Transmission electron microscopy (TEM):**

A small portion of the vesicle suspension was dialyzed against distilled water to remove any salts from the phosphate buffer. The suspension (20 µL, 0.1 mg/mL) was then placed on a Carbon/Formvar® grid and was left to stand for 5 min. The excess solution was then blotted off using a piece of filter paper. The resulting sample was dried in air overnight before imaging. Imaging was performed using a Phillips CM10 microscope operating at 80 kV with a 40 µm aperture.

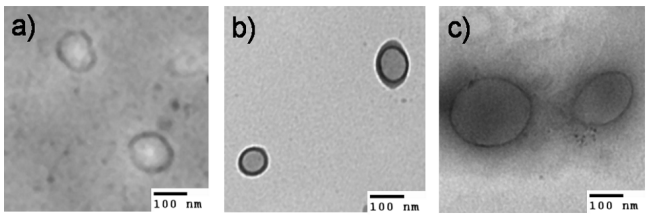


**Figure S4.** TEM images of (a) naked polymersome **3**; (b) dendritic Gd(III)-functionalized polymersomes **6**; (c) non-dendritic Gd(III)-functionalized polymersomes **7**.

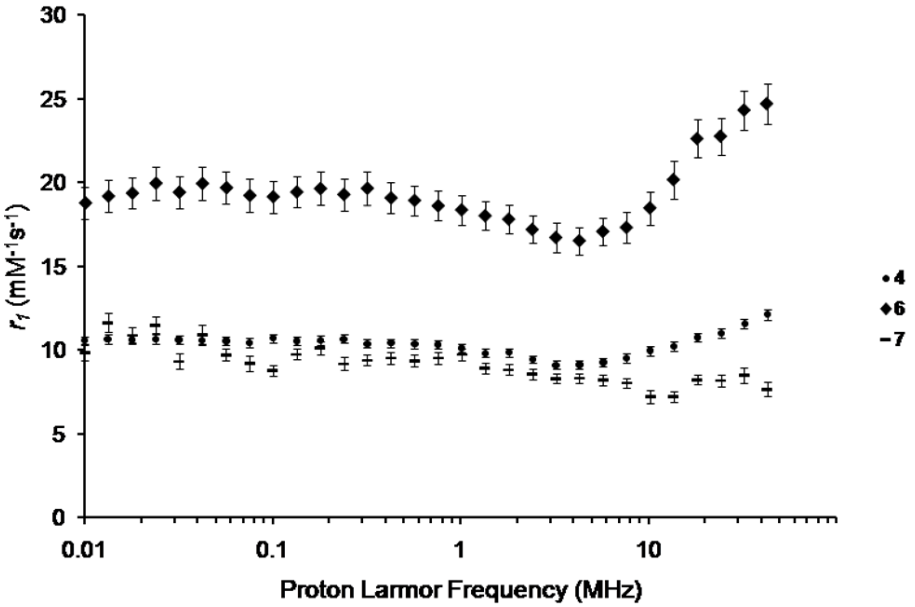


**Figure S5.** Longitudinal relaxivity ($r_1$) of dendron **4**, polymersome **6**, and polymersome **7** in phosphate buffer (0.1 M, pH 7.4) as a function of field strength at 310 K.

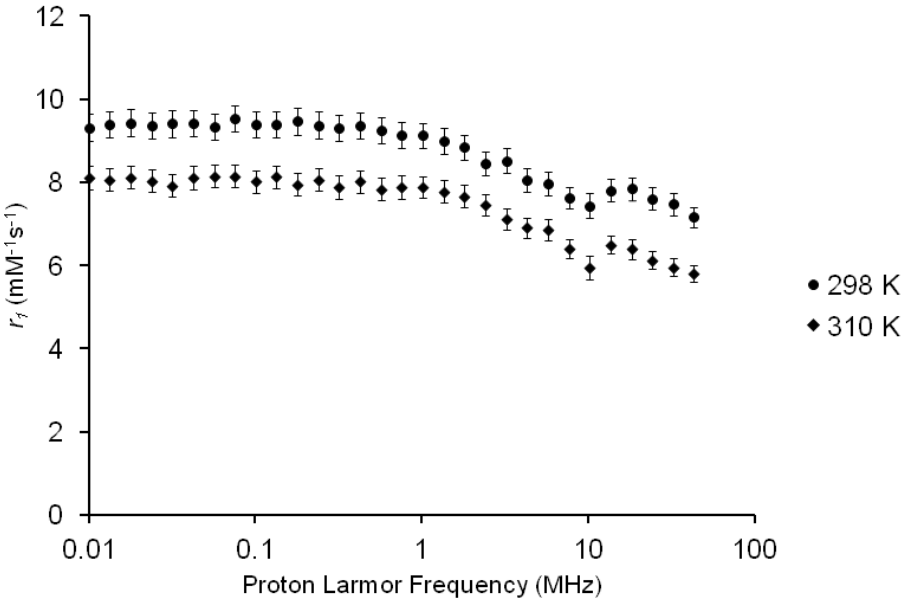


**Figure S6.** Longitudinal relaxivity ($r_1$) of unpurified **5** in phosphate buffer (0.1 M, pH 7.4) as a function of field strength at 298 and 310 K. Note that the presence of excess Gd(III) likely present as Gd(III)$(H_2O)_8$ increases the relaxivity.

**Table S1**. NMRD data for **4**, **6**, and **7** at 298 K.

| | Dendron **4** | | Polymersome **6** | | Polymersome **7** | |
|---|---|---|---|---|---|---|
| Frequency (MHz) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) |
| 42.485 | 13.9468 | 0.35583 | 29.1871 | 1.42059 | 11.2262 | 0.4526 |
| 32.226 | 13.0277 | 0.34114 | 28.8367 | 1.37637 | 12.532 | 0.47005 |
| 24.151 | 12.5703 | 0.35946 | 27.3942 | 1.3068 | 10.8241 | 0.39216 |
| 18.095 | 11.9149 | 0.31532 | 25.4439 | 1.21532 | 10.4419 | 0.39374 |
| 13.56 | 11.5797 | 0.37432 | 24.2906 | 1.23797 | 8.71823 | 0.36866 |
| 10.165 | 11.2655 | 0.30497 | 22.3345 | 1.19751 | 7.61084 | 0.46985 |
| 7.6177 | 10.6191 | 0.26476 | 20.4367 | 0.98503 | 6.56897 | 0.3817 |
| 5.7081 | 10.3709 | 0.27915 | 20.2217 | 1.02722 | 7 | 0.42405 |
| 4.2784 | 10.2498 | 0.24824 | 19.4613 | 0.98773 | 7.42956 | 0.41578 |
| 3.2065 | 10.394 | 0.26049 | 19.3263 | 0.92909 | 7.9399 | 0.43684 |
| 2.401 | 10.7171 | 0.25894 | 19.5809 | 0.93411 | 7.23547 | 0.39227 |
| 1.8005 | 10.849 | 0.26617 | 20.0514 | 0.97972 | 8.60099 | 0.44634 |
| 1.3483 | 10.9211 | 0.26433 | 20.4173 | 0.9928 | 8.75616 | 0.44744 |
| 1.0104 | 11.2019 | 0.27076 | 20.8922 | 0.9895 | 8.50837 | 0.39931 |
| 0.75806 | 11.4886 | 0.27293 | 21.3698 | 1.01748 | 8.40739 | 0.38531 |
| 0.56802 | 11.6184 | 0.28249 | 21.7274 | 1.03445 | 8.70394 | 0.35741 |
| 0.42589 | 11.5538 | 0.27788 | 22.0061 | 1.04202 | 8.6468 | 0.36749 |
| 0.31839 | 11.6476 | 0.28257 | 21.7189 | 1.05168 | 9.30443 | 0.37775 |
| 0.23878 | 11.6388 | 0.28092 | 22.1196 | 1.09736 | 9.38719 | 0.3836 |
| 0.17926 | 11.8268 | 0.28324 | 21.8339 | 1.04392 | 8.98621 | 0.3988 |
| 0.13402 | 11.8385 | 0.29036 | 22.4487 | 1.08742 | 9.65369 | 0.36336 |
| 0.10033 | 11.9043 | 0.28695 | 22.6929 | 1.0932 | 9.2335 | 0.41176 |
| 0.07539 | 11.821 | 0.31517 | 22.6322 | 1.09317 | 9.44483 | 0.38747 |
| 0.05663 | 11.8748 | 0.30641 | 22.2902 | 1.11094 | 9.55961 | 0.36876 |
| 0.04216 | 11.8676 | 0.29306 | 22.4021 | 1.11577 | 9.57291 | 0.3576 |
| 0.03178 | 11.819 | 0.29499 | 22.1639 | 1.06491 | 9.82512 | 0.38554 |
| 0.02384 | 11.8798 | 0.28709 | 23.2296 | 1.14638 | 10.3557 | 0.42257 |
| 0.01787 | 11.8476 | 0.2852 | 22.3151 | 1.11062 | 9.82217 | 0.41358 |
| 0.01332 | 11.8582 | 0.28578 | 22.7316 | 1.1307 | 9.86355 | 0.39769 |
| 0.01005 | 11.8228 | 0.28582 | 22.4915 | 1.09679 | 9.75123 | 0.43025 |

**Table S2**. NMRD data for **4**, **6**, and **7** at 310 K.

| | Dendron **4** | | Polymersome **6** | | Polymersome **7** | |
|---|---|---|---|---|---|---|
| Frequency (MHz) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) |
| 42.485 | 12.12974 | 0.308419 | 24.70432 | 1.202339 | 7.675889 | 0.440764 |
| 32.226 | 11.57483 | 0.297817 | 24.32695 | 1.155758 | 8.508374 | 0.430055 |
| 24.151 | 11.01165 | 0.274025 | 22.76779 | 1.093878 | 8.187685 | 0.326891 |
| 18.095 | 10.7773 | 0.27112 | 22.62621 | 1.143689 | 8.252217 | 0.299043 |
| 13.56 | 10.24124 | 0.256736 | 20.18495 | 1.146539 | 7.230542 | 0.327636 |
| 10.165 | 9.982981 | 0.278239 | 18.49589 | 0.994324 | 7.226601 | 0.373374 |
| 7.6177 | 9.529907 | 0.25443 | 17.33842 | 0.933652 | 8.051232 | 0.296329 |
| 5.7081 | 9.277963 | 0.23684 | 17.1 | 0.829593 | 8.232512 | 0.332303 |
| 4.2784 | 9.143037 | 0.238939 | 16.54358 | 0.808106 | 8.333005 | 0.291729 |
| 3.2065 | 9.123537 | 0.244629 | 16.73642 | 0.863996 | 8.324138 | 0.299654 |
| 2.401 | 9.458981 | 0.230666 | 17.21684 | 0.82571 | 8.579803 | 0.314226 |
| 1.8005 | 9.874537 | 0.243801 | 17.83 | 0.867142 | 8.837931 | 0.308924 |
| 1.3483 | 9.832926 | 0.240478 | 18.03611 | 0.870415 | 8.933498 | 0.332639 |
| 1.0104 | 10.1245 | 0.248905 | 18.38716 | 0.890337 | 9.749754 | 0.369044 |
| 0.75806 | 10.34187 | 0.251679 | 18.62432 | 0.894888 | 9.553202 | 0.355386 |
| 0.56802 | 10.38541 | 0.25377 | 18.94705 | 0.902074 | 9.370443 | 0.363834 |
| 0.42589 | 10.43285 | 0.252389 | 19.09358 | 0.900006 | 9.554187 | 0.357284 |
| 0.31839 | 10.40139 | 0.256121 | 19.66316 | 0.993456 | 9.399507 | 0.317746 |
| 0.23878 | 10.68167 | 0.260583 | 19.30158 | 0.971088 | 9.200985 | 0.36774 |
| 0.17926 | 10.60106 | 0.259376 | 19.65337 | 1.000355 | 10.14089 | 0.408701 |
| 0.13402 | 10.56869 | 0.26436 | 19.45042 | 0.941913 | 9.776355 | 0.334029 |
| 0.10033 | 10.71293 | 0.271159 | 19.16611 | 0.964125 | 8.791133 | 0.312885 |
| 0.07539 | 10.44635 | 0.26105 | 19.23768 | 0.986247 | 9.223645 | 0.444246 |
| 0.05663 | 10.56539 | 0.261974 | 19.69958 | 0.963367 | 9.727094 | 0.362393 |
| 0.04216 | 10.60959 | 0.263527 | 19.95242 | 0.991791 | 10.94581 | 0.552264 |
| 0.03178 | 10.62474 | 0.269735 | 19.43695 | 0.970396 | 9.330049 | 0.466202 |
| 0.02384 | 10.67987 | 0.273295 | 19.96768 | 0.987754 | 11.52217 | 0.519033 |
| 0.01787 | 10.6393 | 0.26195 | 19.37705 | 0.942645 | 10.90394 | 0.478739 |
| 0.01332 | 10.67291 | 0.26032 | 19.19758 | 0.93875 | 11.66059 | 0.553324 |
| 0.01005 | 10.57759 | 0.257902 | 18.79895 | 0.949368 | 9.871429 | 0.493652 |

**Table S3**. NMRD data for unpurified compound **5** at 298 and 310 K.

| | 298 K | | 310 K | |
|---|---|---|---|---|
| Frequency (MHz) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) | $r_1$ ($mM^{-1}s^{-1}$) | ± error ($mM^{-1}s^{-1}$) |
| 42.485 | 7.164357 | 0.239302 | 5.806553 | 0.198736 |
| 32.226 | 7.4717 | 0.26715 | 5.95605 | 0.215379 |
| 24.151 | 7.61 | 0.262536 | 6.12295 | 0.210226 |
| 18.095 | 7.84835 | 0.270608 | 6.39345 | 0.238233 |
| 13.56 | 7.81255 | 0.283246 | 6.5026 | 0.224501 |
| 10.165 | 7.442025 | 0.292533 | 5.94605 | 0.282405 |
| 7.6177 | 7.62545 | 0.265663 | 6.40275 | 0.239543 |
| 5.7081 | 7.9683 | 0.285034 | 6.863 | 0.251785 |
| 4.2784 | 8.0546 | 0.278805 | 6.9062 | 0.243733 |
| 3.2065 | 8.51975 | 0.290723 | 7.11605 | 0.247265 |
| 2.401 | 8.4612 | 0.286282 | 7.456 | 0.257229 |
| 1.8005 | 8.84115 | 0.296912 | 7.66125 | 0.268017 |
| 1.3483 | 8.9957 | 0.302398 | 7.78315 | 0.265708 |
| 1.0104 | 9.1258 | 0.306825 | 7.8839 | 0.261812 |
| 0.75806 | 9.1464 | 0.30944 | 7.87605 | 0.289503 |
| 0.56802 | 9.241 | 0.31658 | 7.83935 | 0.275286 |
| 0.42589 | 9.3689 | 0.317881 | 8.01545 | 0.269447 |
| 0.31839 | 9.29925 | 0.317361 | 7.88775 | 0.277594 |
| 0.23878 | 9.37455 | 0.320122 | 8.0635 | 0.278503 |
| 0.17926 | 9.46935 | 0.319043 | 7.95385 | 0.272022 |
| 0.13402 | 9.3859 | 0.315734 | 8.1297 | 0.274145 |
| 0.10033 | 9.3894 | 0.312762 | 8.0159 | 0.268276 |
| 0.075388 | 9.5268 | 0.314929 | 8.15365 | 0.276447 |
| 0.056625 | 9.3446 | 0.314749 | 8.15405 | 0.283728 |
| 0.042161 | 9.4225 | 0.32211 | 8.1109 | 0.272298 |
| 0.031778 | 9.4146 | 0.323253 | 7.9203 | 0.275189 |
| 0.023836 | 9.3698 | 0.3204 | 8.03265 | 0.276627 |
| 0.017874 | 9.43465 | 0.32513 | 8.1256 | 0.273448 |
| 0.013316 | 9.38825 | 0.319244 | 8.0661 | 0.279237 |
| 0.010053 | 9.32145 | 0.320652 | 8.10275 | 0.289865 |

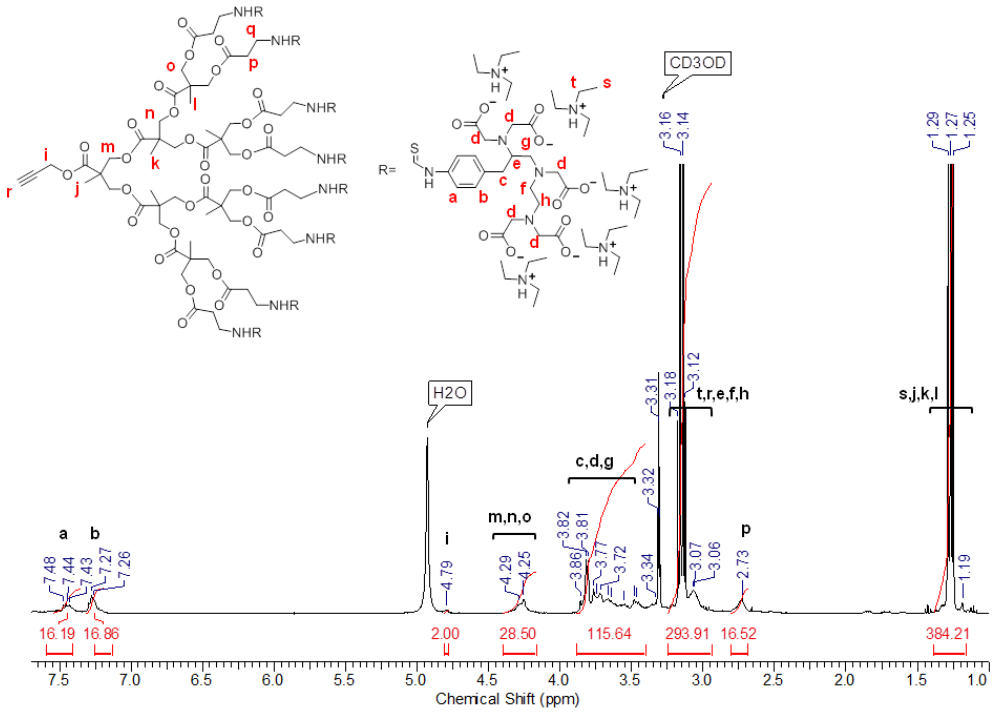


**Figure S7**. $^{1}$H NMR spectrum of dendron **10** ($CD_3OD$)

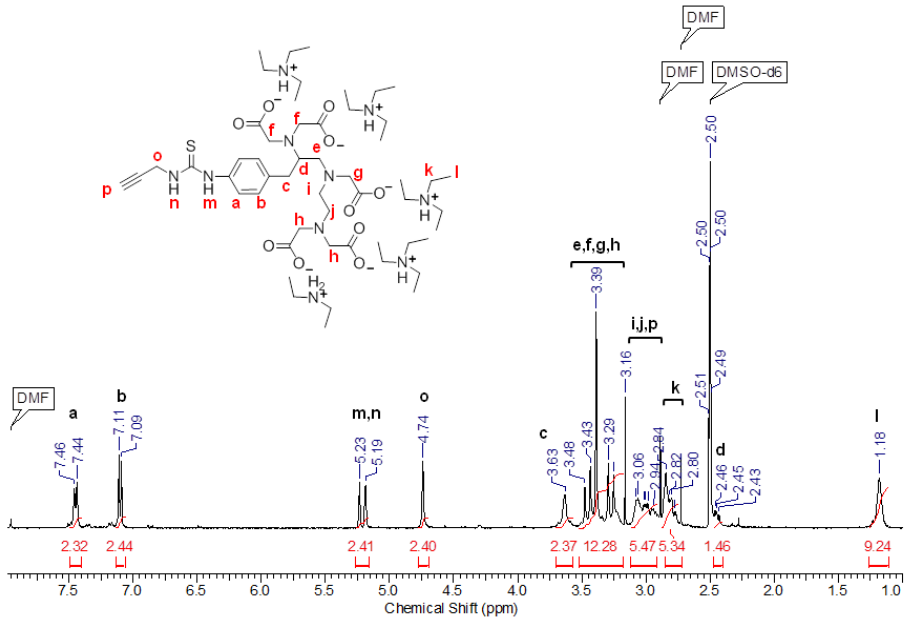


**Figure S8**. $^{1}$H NMR spectrum of compound **11** (DMSO-$d_6$)

**References:**

1. B. Li; A. L. Martin and E. R. Gillies, *Chem. Commun.* **2007**, 5217-5219.

2. A. Nazemi; R. C. Amos; C. V. Bonduelle and E. R. Gillies, *J. Polym. Sci. A: Polym. Chem*. **2011**, *49*, 2546-2559.

3. A. Barge; G. Cravotto; E. Gianolio and F. Fedeli, *Contrast Med. Mol. Imaging* **2006**, *1*, 184-188.