

Electronic Supplementary Information for:

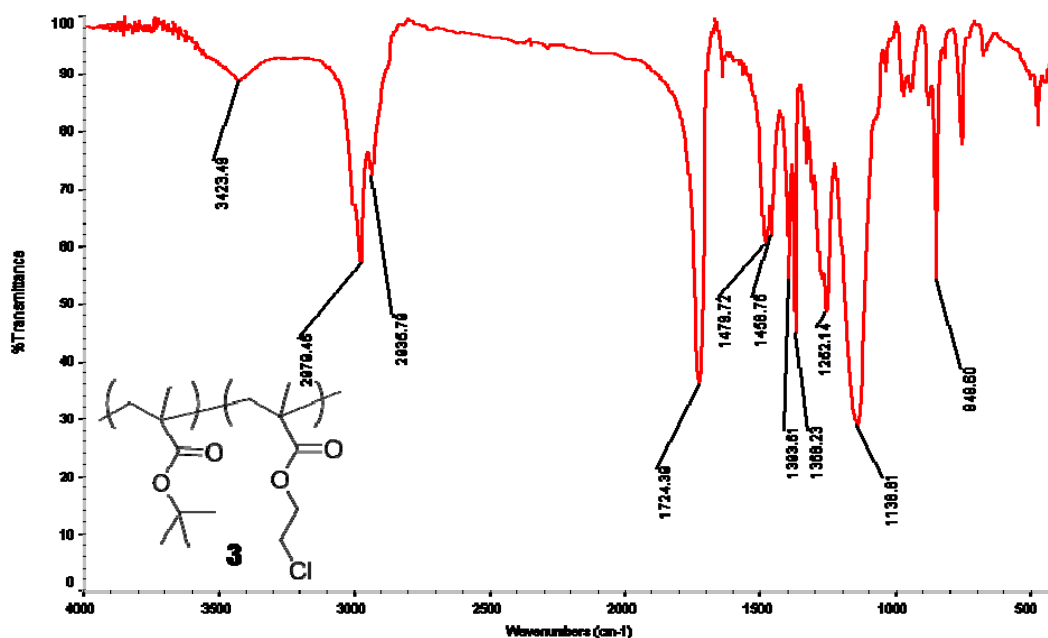
## Single-chain polyacrylic nanoparticles with multiple Gd(III) centres as potential MRI contrast agents

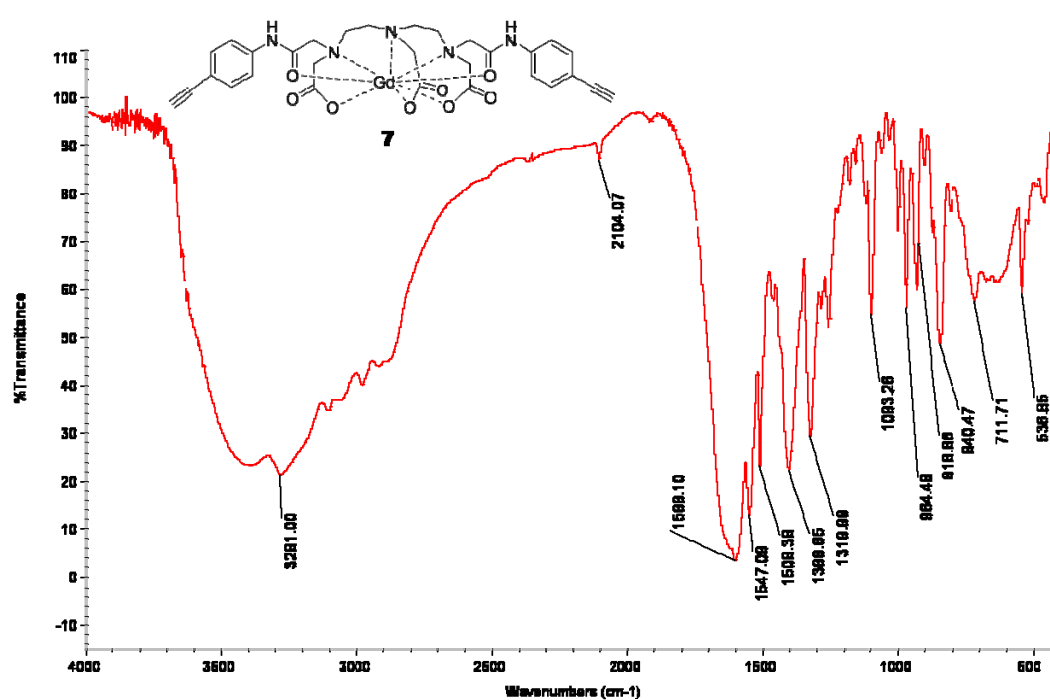
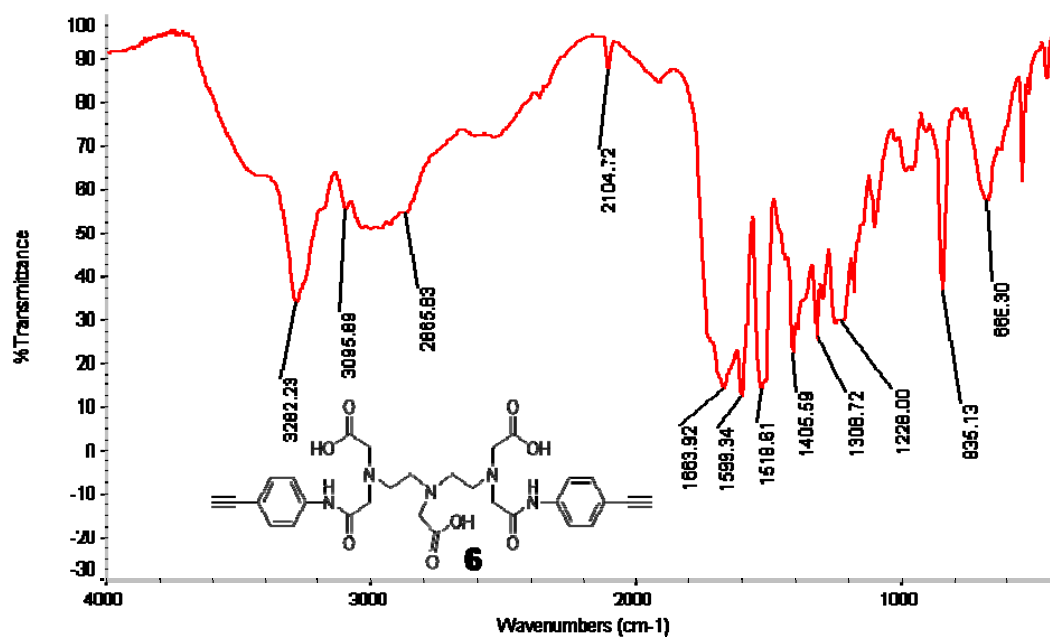
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Ibon Odriozola<sup>a\*</sup>

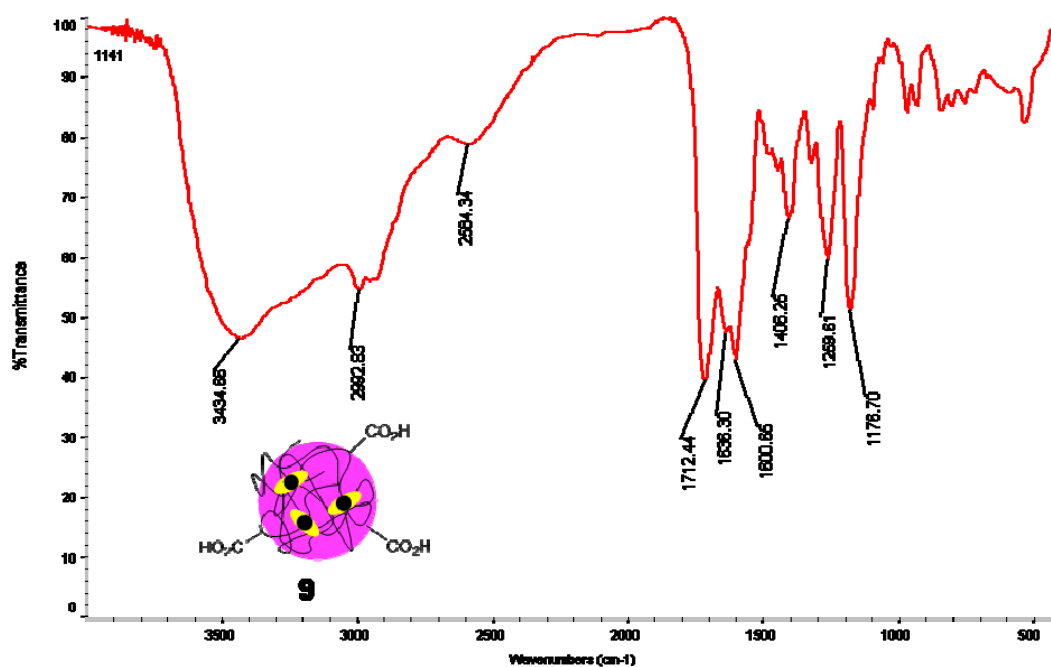
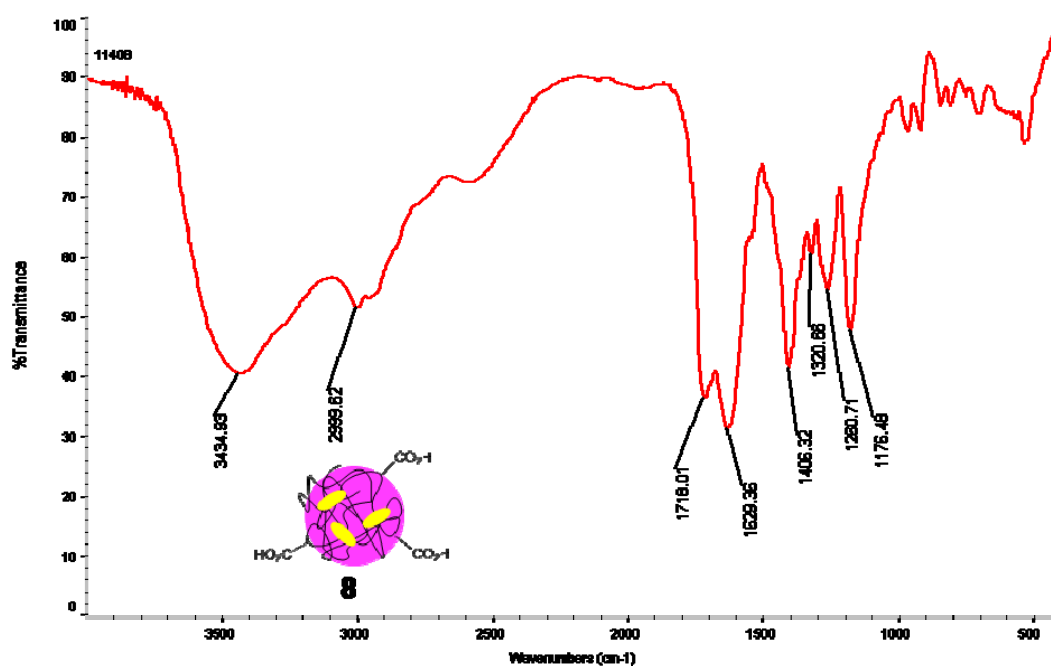
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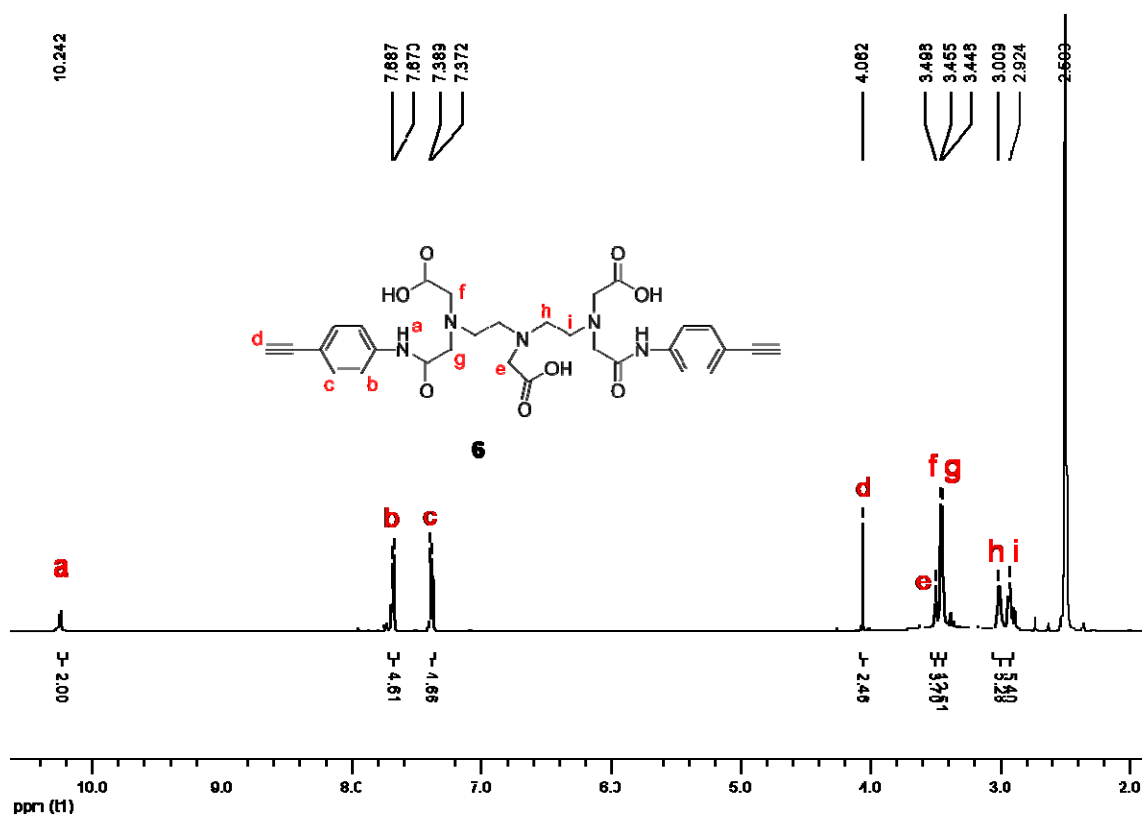
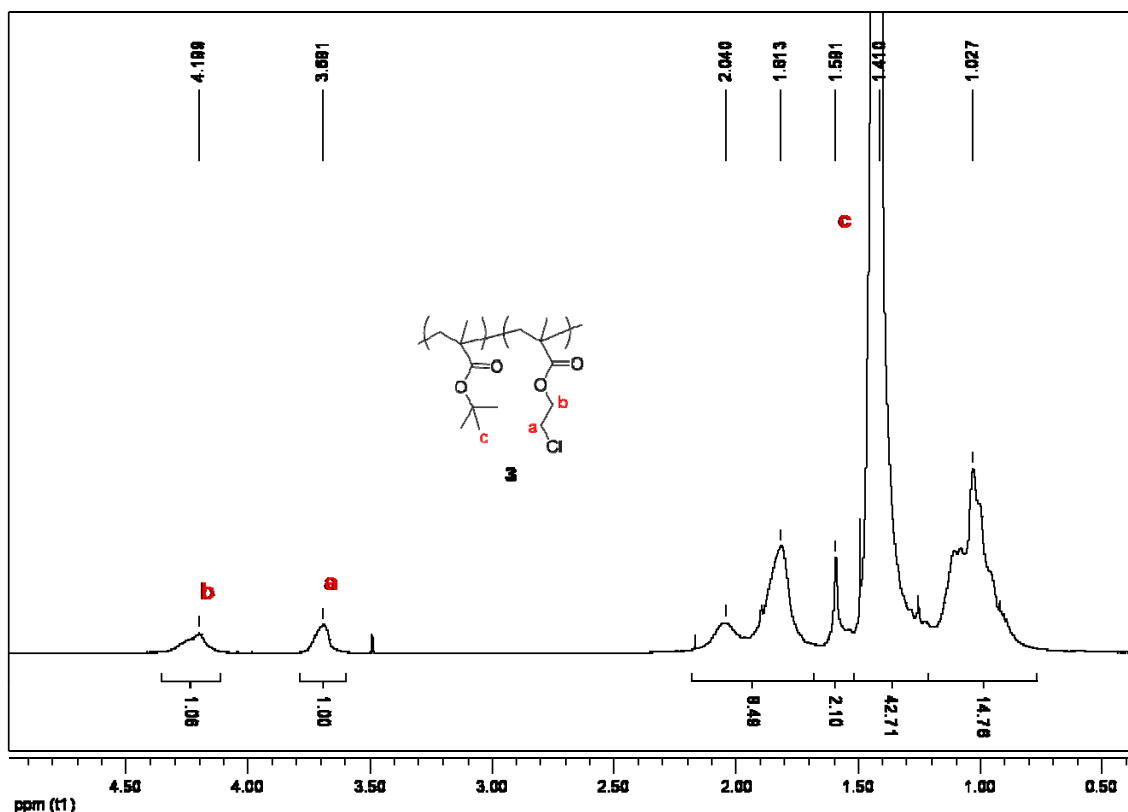
### FT-IR Spectra



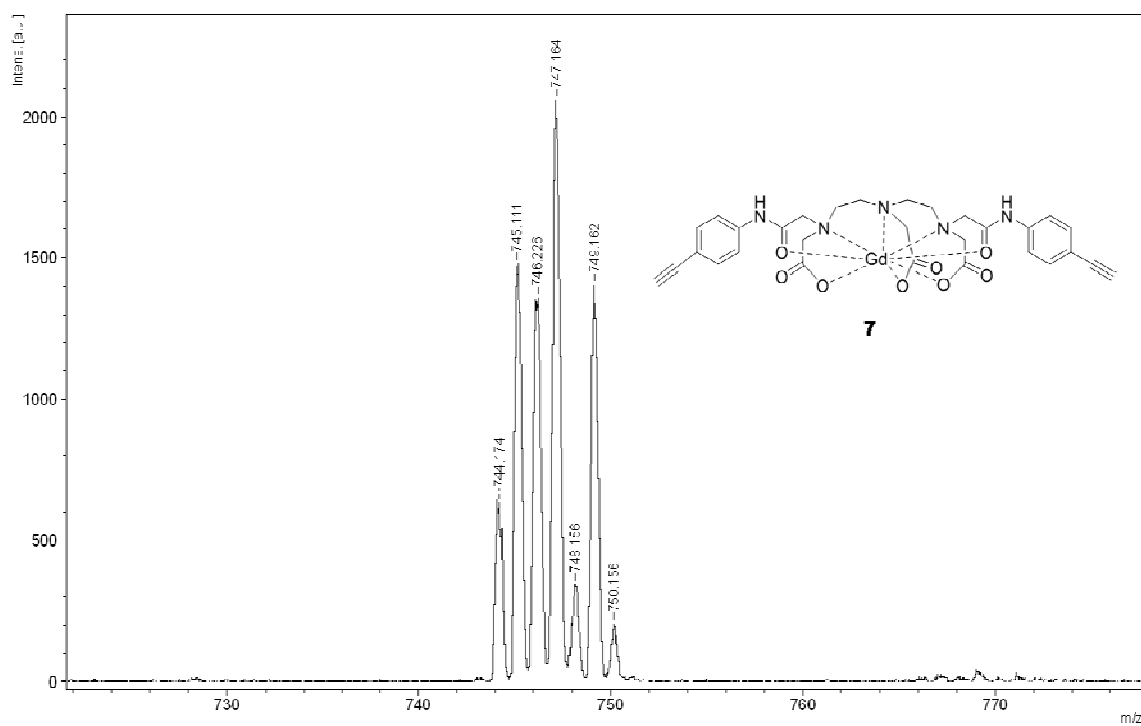
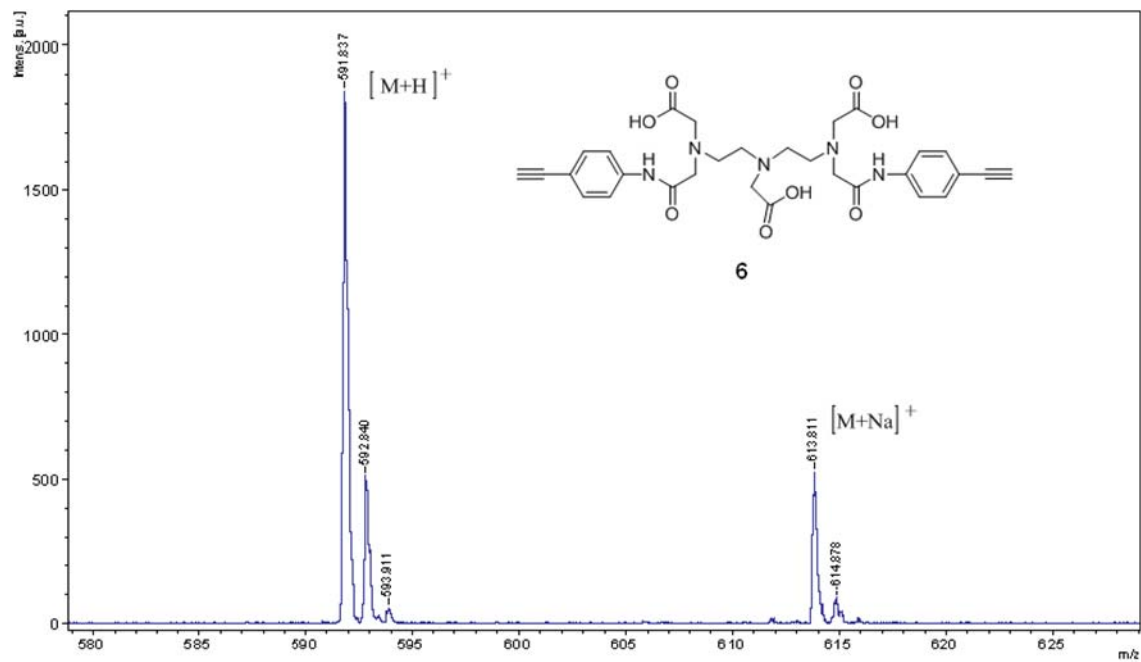


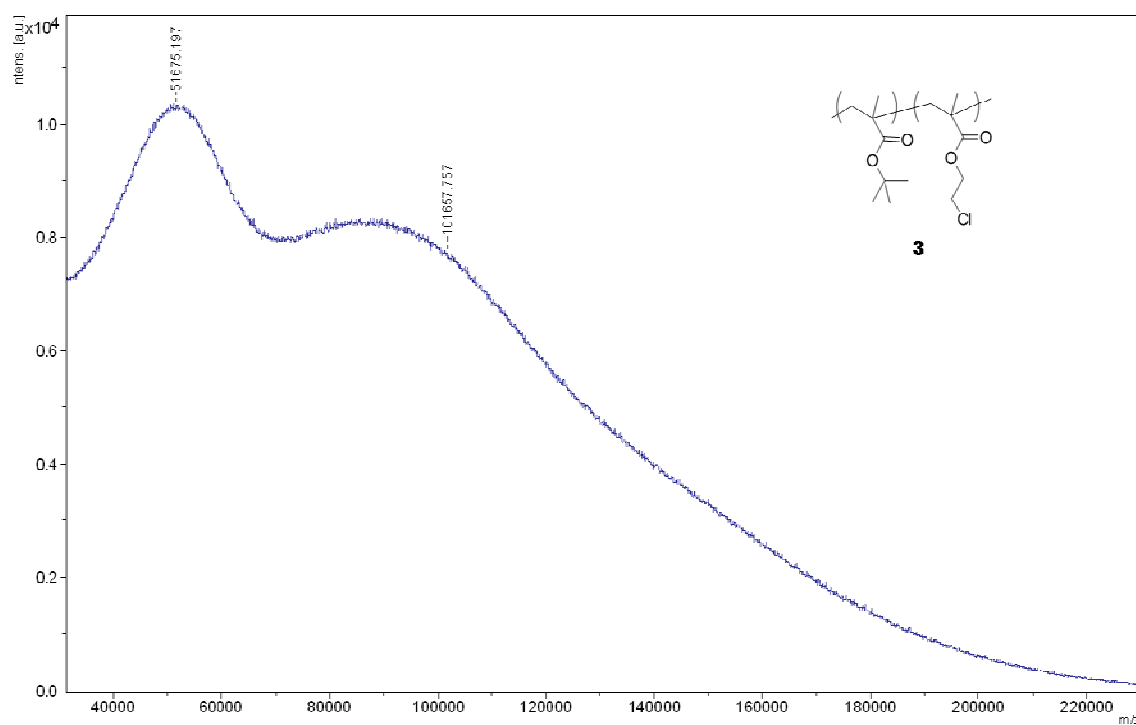


<sup>1</sup>H NMR Spectra

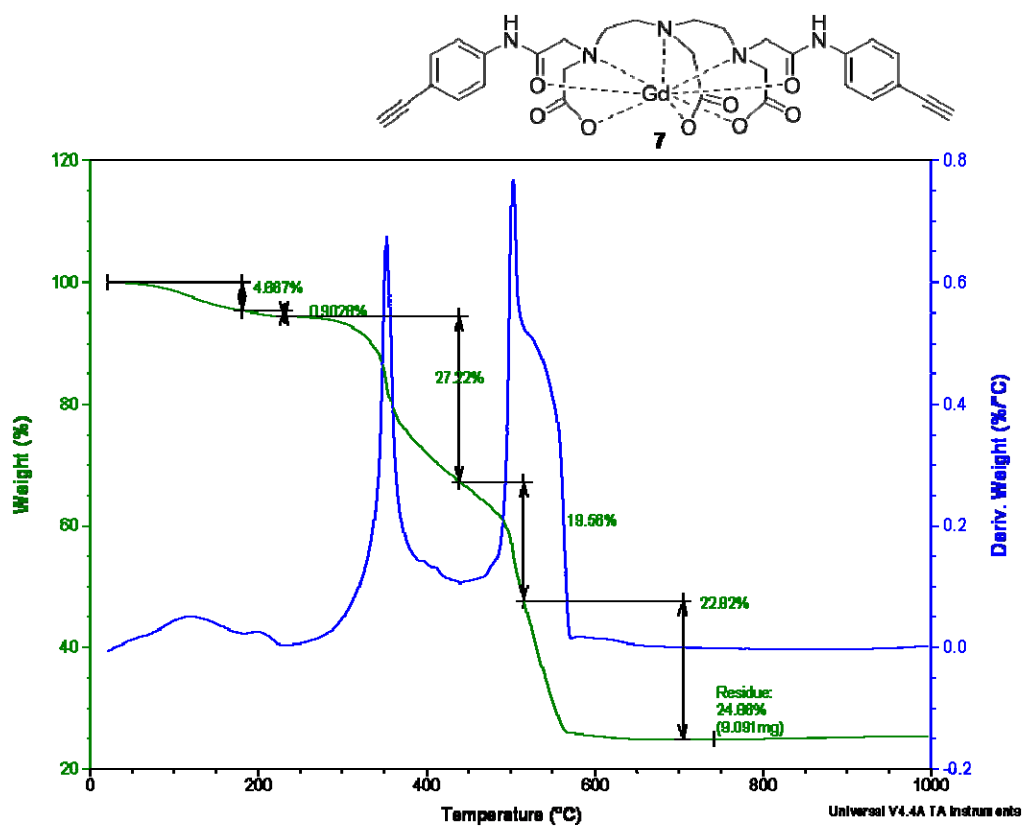


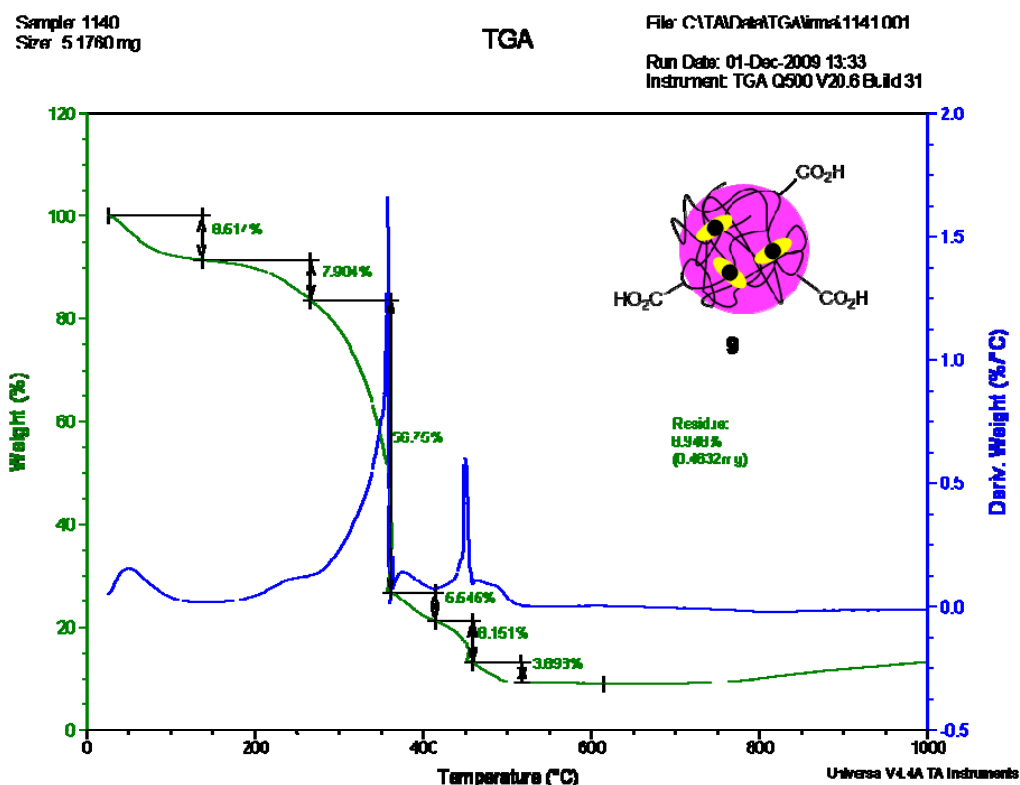
### MALDI-TOF Spectra





### TGA spectra





#### Gd content calculations for PNPs 10

TGA: TGA analyses were run in air, from room-temperature to 1000 °C at a rate of 10 °C min<sup>-1</sup>.

Initial sample: 5.176 mg

Final residue: 0.4632 mg (8.948 %)

From the TGA curve we eliminate the 1<sup>st</sup> weight loss which corresponds to water (8.514%).

Initial PNPs weight – water = dry PNPs weight

$$5.176 - (5.176 \times 0.08514) = 4.735 \text{ mg dry PNPs}$$

ICP: Once the samples were burned in the TGA oven to remove all the organics, the residue was dissolved in ICP grade nitric acid (50 mL, HNO<sub>3</sub> final concentration 0.2%), and analyzed by ICP for Gd.

Results: the concentration of Gd was found to be 5.35 ppm (= 5.35 mg Gd·L<sup>-1</sup>).

As the residue was dissolved in 50 mL of nitric acid:

$$50 \text{ mL} \cdot 5.35 \text{ mg Gd} \cdot \text{L}^{-1} = 50 \cdot 10^{-3} \text{ L} \cdot 5.35 \text{ mg Gd} \cdot \text{L}^{-1} = 0.2675 \text{ mg Gd in total.}$$

Then Gd wt% of the initial sample:

$$\text{Gd wt\%} = (0.2675 \text{ mg Gd} / 4.735 \text{ mg PNP}) \cdot 100 = 5.6 \text{ wt\% Gd}$$

To calculate how many Gd<sup>3+</sup> ions are per DTPA center, first we calculate the number of DTPA mmoles that are in 4.735 mg of PNPs. For that we need to calculate the molecular weight of the PNPs **9**. Taking into account that we have started from a 9:1 ratio of tBMA and CIEMA

monomers, the repeating unit of this compound can be envisaged as a Gd-DTPA unit attached to 18 units of methacrylic acid (Figure S1). This gives a molecular weight of 2605 g/mol DTPA.

Thus, the initial amount of PNPs **10** was  $4.735 \text{ mg} / 2605 = 1.82 \times 10^{-3} \text{ mmol DTPA}$ .

The amount of Gd was found to be  $0.2675 \text{ mg} / 157.25 = 1.70 \times 10^{-3} \text{ mmol Gd}$ , which means that approximately 93% of the DTPA centers are occupied with  $\text{Gd}^{3+}$  ions. If the calculations are made considering the polymer in form of sodium methacrylate salt, an occupancy of 110% is obtained. The sample for ICP was taken from a neutral freeze-dried sample, so part of the carboxylic groups are expected to be as the sodium salt form. From these results we can conclude that practically all the DTPA units are Gd-loaded.

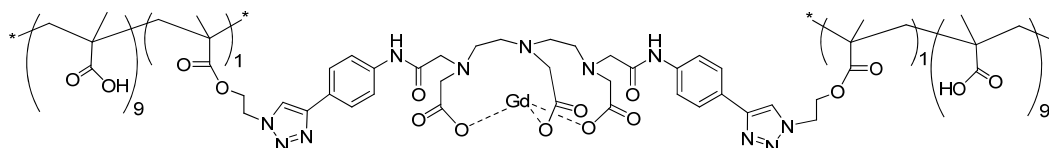
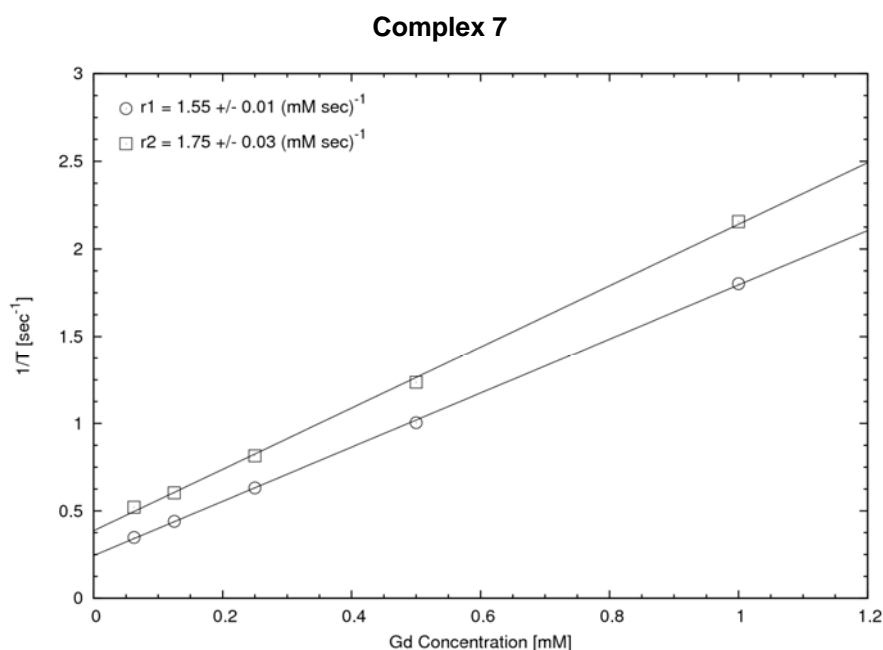


Figure S1. Chemical structure of the repeating unit of PNPs **10**.

#### Average number of $\text{Gd}^{3+}$ ions per nanoparticle

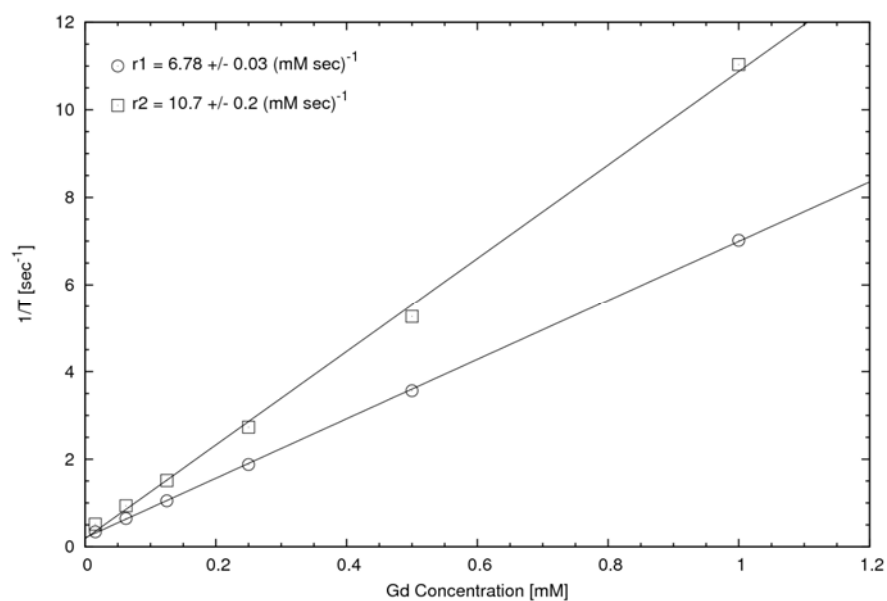
Considering a  $M_w$  of  $\sim 46 \text{ kDa}$  and a molecular weight of 2605 g per each DTPA unit (calculated above), each nanoparticle would be loaded with an average of  $46000/2605 = 18 \text{ Gd}^{3+}$  ions.

#### Relaxivity values





### PNPs 9



### Magnevist®

