

Supplementary Materials :

2. Results and Discussion

2.5. Complementary Th Content in the Dose-Response and Kinetics Studies of HAp-Th Subjected to the Chelates

For each sample, the complementary part, i.e., 1 mL of the remaining supernatant plus the 5 mg of HAp-Th powder were mineralized as described in the manuscript (5 mL of 67–70% HNO<sub>3</sub>, Plasmapur plus degree, SCP Science, at 120 ° C during 2 h). The digested samples were then evaporated to dryness at 90 °C using a heating block. Determination of the Th concentrations was carried out by resorting to external calibration with standards of Th prepared from single element ICP-MS standard solutions (SPEX Certi-Prep, Inc.) for thorium. Results were expressed as mean ( $\pm$ SD) from triplicates.

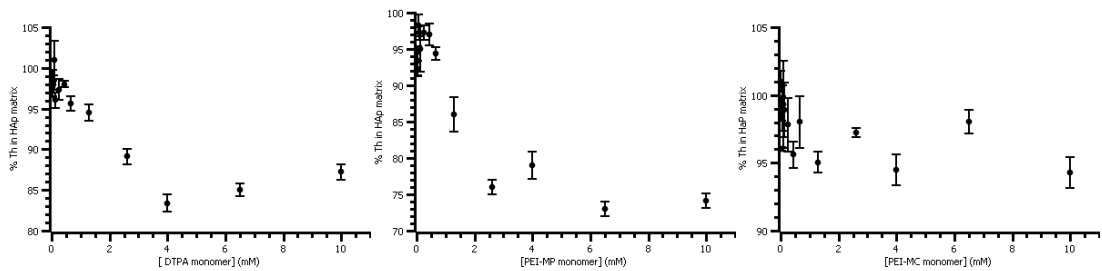


Figure S1. Complementary Th content (%) recovery for the dose-response experiments

2.7. Kinetics of HAp-Th chelate systems

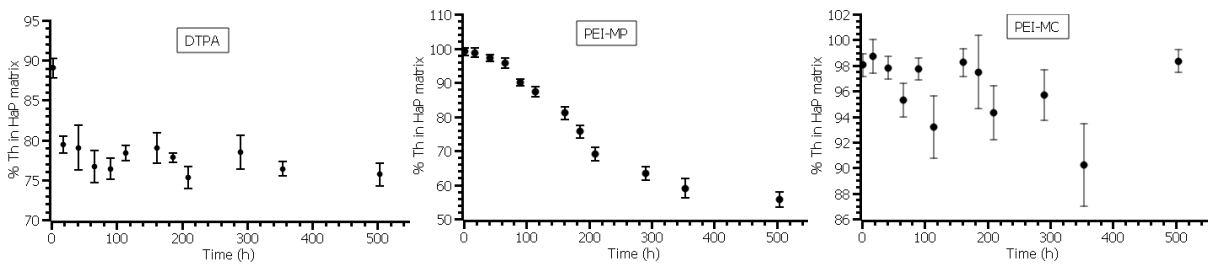


Figure S2. Complementary Th content (%) recovery for the kinetics experiments

Table S1. Complementary Th content recovery after a cumulative dose administration

	Th % recovery at d <sub>12</sub>	Th % recovery at d <sub>21</sub>
1 dose only from d <sub>1</sub>		54.8 $\pm$ 2.92
2 doses <sup>a</sup>	64.3 $\pm$ 1.01	36.19 $\pm$ 0.89

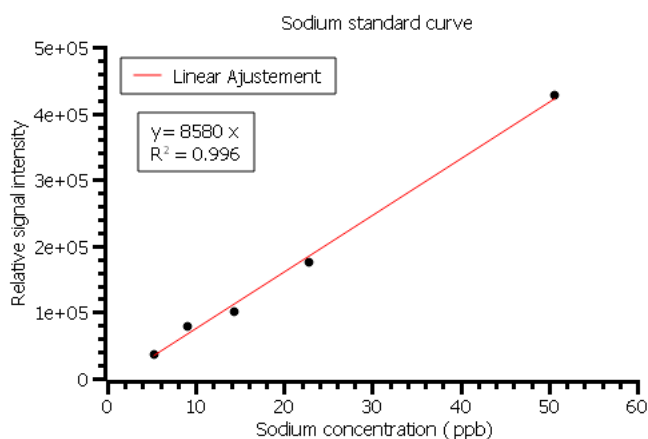
<sup>a</sup> independent experiment: medium was withdrawn at d<sub>12</sub> and replaced with a fresh 6.3 mM 1-mer PEI-MP

3. Materials and Methods

3.2. Synthesis of PEI Chelates

Counterions Titration into PEI-MC and PEI-MP

Sodium Titration (ICP-MS)



**Figure S3.** Na<sup>+</sup> titration curve

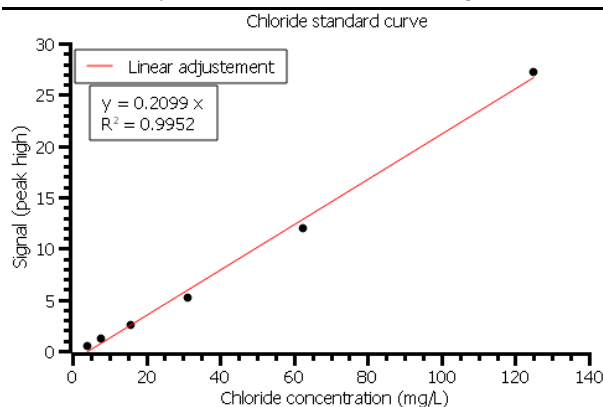
After mineralization of PEI-MC or PEI-MP (15 mg), 2.18 mg of sodium,  $2.2 \pm 0.2$  Na / monomer was found for PEI-MC and 2.46 mg of sodium,  $3.5 \pm 0.4$  Na/monomer in the case of PEI-MP.

#### Chloride Titration (ion chromatography)

Chloride solution titration solutions were prepared from commercial standard solution (100 mg/L) as follow (results were expressed as mean from triplicates).

**Table S2.** Signal (peak high) versus chloride concentration

Signal (peak high)	[Cl <sup>-</sup> ] (mg/L)
0.51	3.91
1.17	7.81
2.56	15.62
5.24	31.25
12.01	62.5
27.2	125



**Figure S4.** Cl<sup>-</sup> titration curve

**Table S3.** Chloride counterion mass % content per polymer

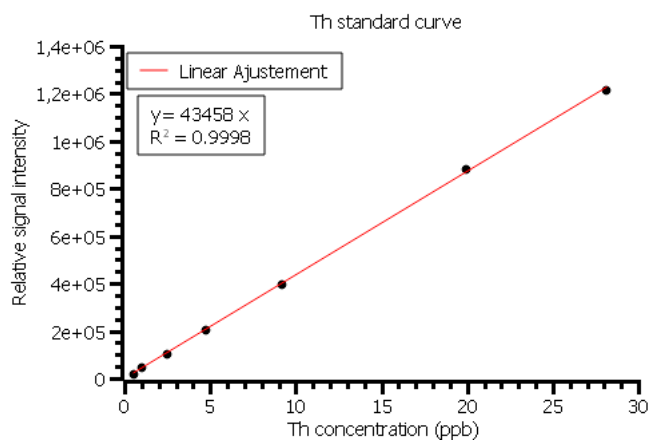
Samples	Signal (peak high)	[Cl <sup>-</sup> ] (mg/L)	[PEI as monomer] (mg/L)	Cl <sup>-</sup> (mass %)
PEI- MC (1/10)	0.85	4.05	3512	0.12
PEI-MP(1/10)	0.12	0.572	2320	0.02

The content of chloride anion was found to be negligible for both PEI-MC and PEI-MP.

### 3.5. Contamination of HAp

#### Th Concentration at Each Washing Step of HAp

After contamination of HAp with  $\text{Th}(\text{CO}_3)_4$ , the HAp-Th powder was submitted to three cycles of centrifugation/washing steps with ultrapure water until no Th could be detected (ICP-MS) into the last filtrate. The first centrifugation step led to  $3.40 \pm 0.04$  mg of Th. The 2<sup>nd</sup> filtrate contained  $1.90 \pm 0.06$  mg of Th and no significative amount of Th was found in the last (third) filtrate.



**Figure S5.** Th titration curve