Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary material for:

Self-assembled Gold Coating Enhances X-ray Imaging of Alginate Microcapsules

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Table S1 PAuNPs size from UV-Visible measurement, DLS and zeta potential.

PAuNPs	UV (nm)	DLS (nm)	Zeta potential (mV)
AuNPs	60.0	63.1±0.4	-47.2±1.8
PMETAC-Au	63.0	66.4±0.8	-27.1±0.9
PMETAC_SH-Au	69.0	68.6±0.9	12.8±1.4
PEGMA_SH-Au	74.0	126.0±4.8	-23.6±0.6

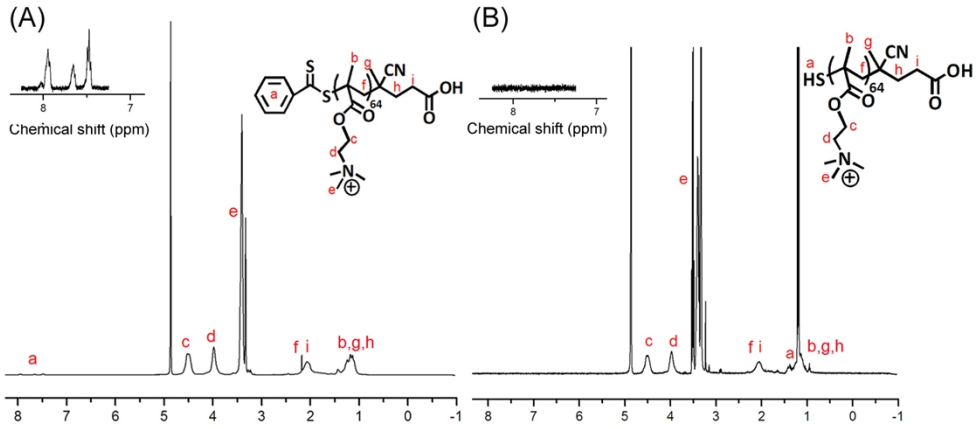

Figure S1 NMR spectra of PMETAC (A) and PMETAC_SH (B).

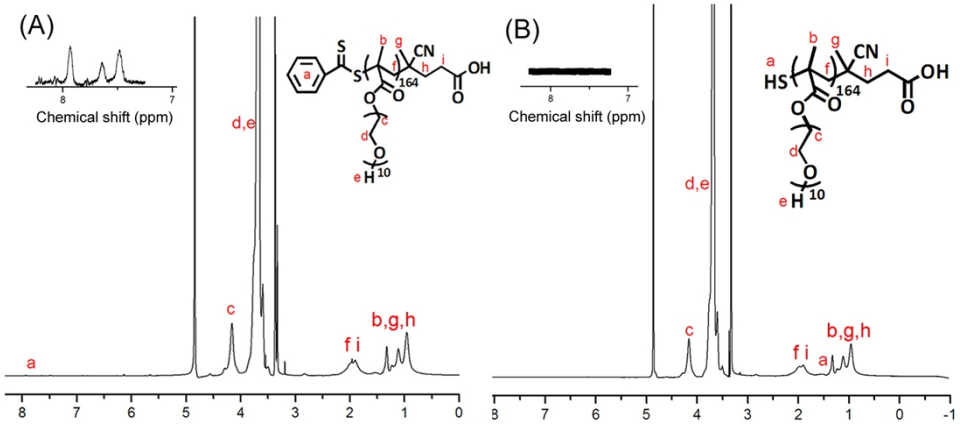

Figure S2 NMR spectra of PEGMA (A) and PEGMA-SH (B).

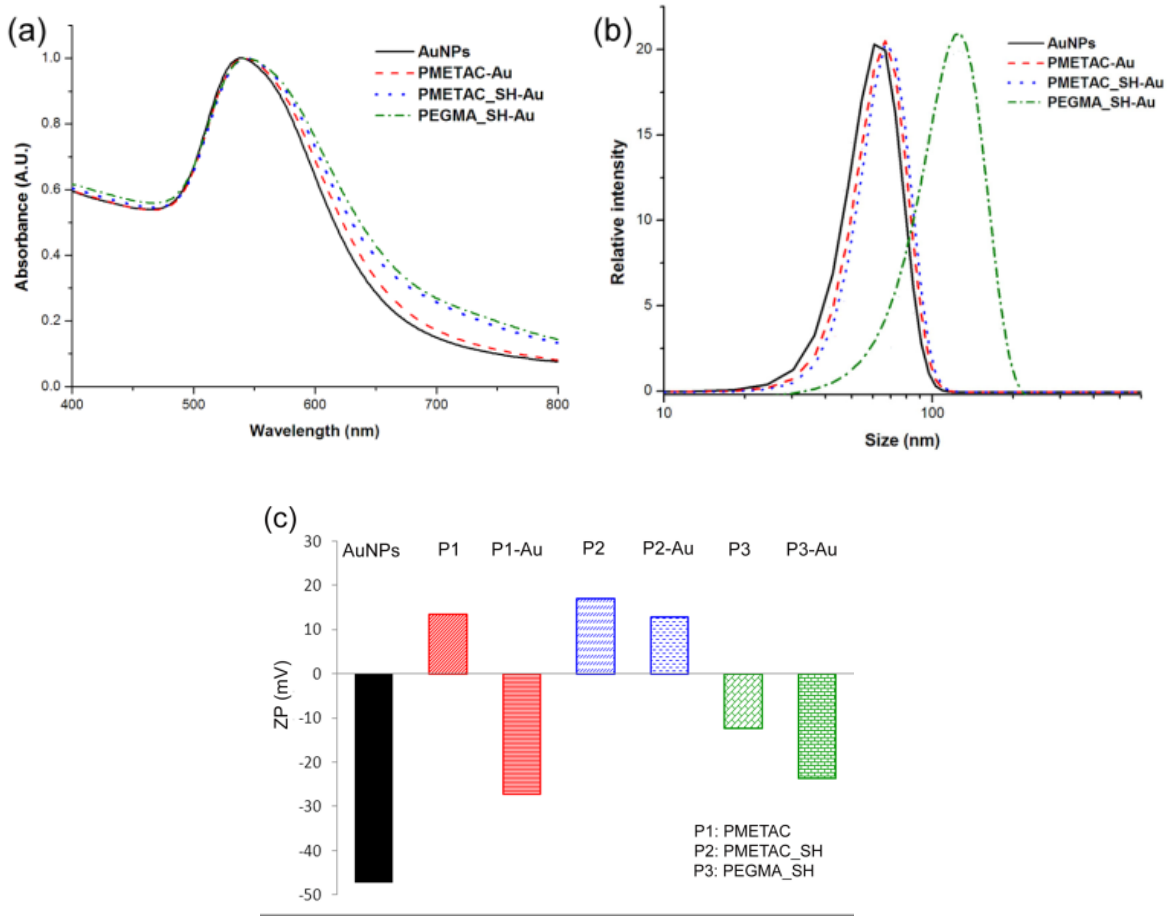

Figure S3 (a) UV-Visible spectra, (b) DLS analysis, and (c) zeta potential analysis of AuNPs and PAuNPs.

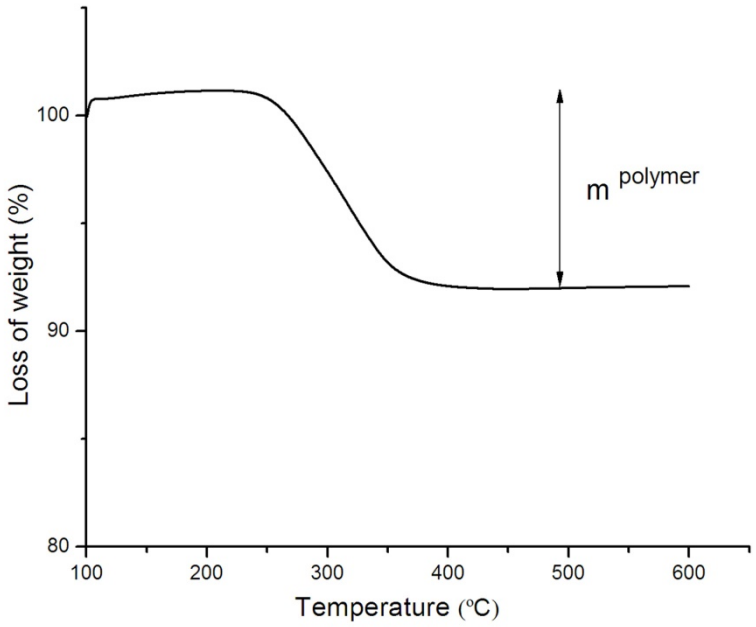

Figure S4 TGA analysis of PEGMA_SH-Au.

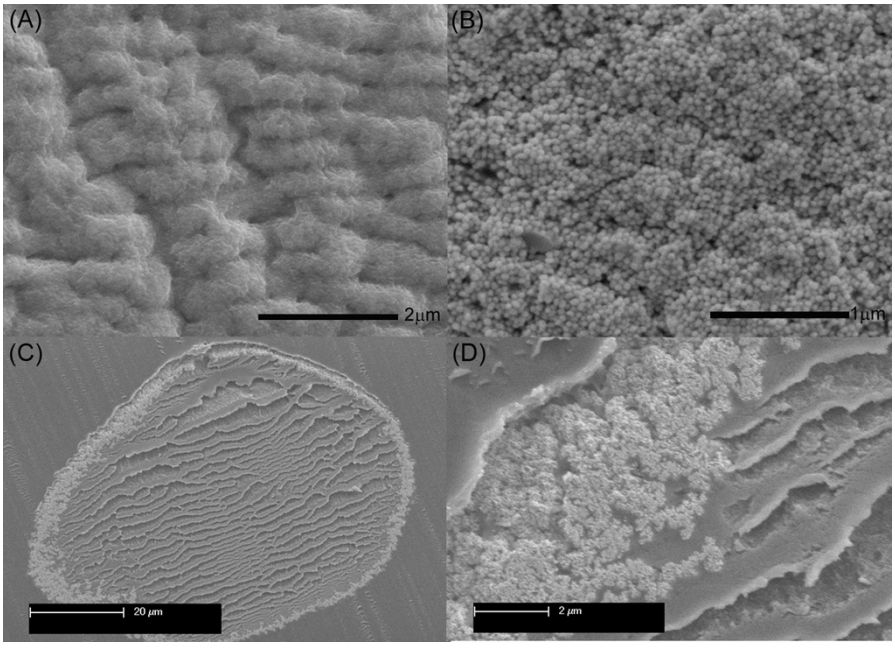

Figure S5 SEM images of (A) alginate MCs surface; (B) PMETAC_SH-Au-MCs surface; Cross-section of PMETAC-Au-MCs with low magnification (C) and high magnification (D).

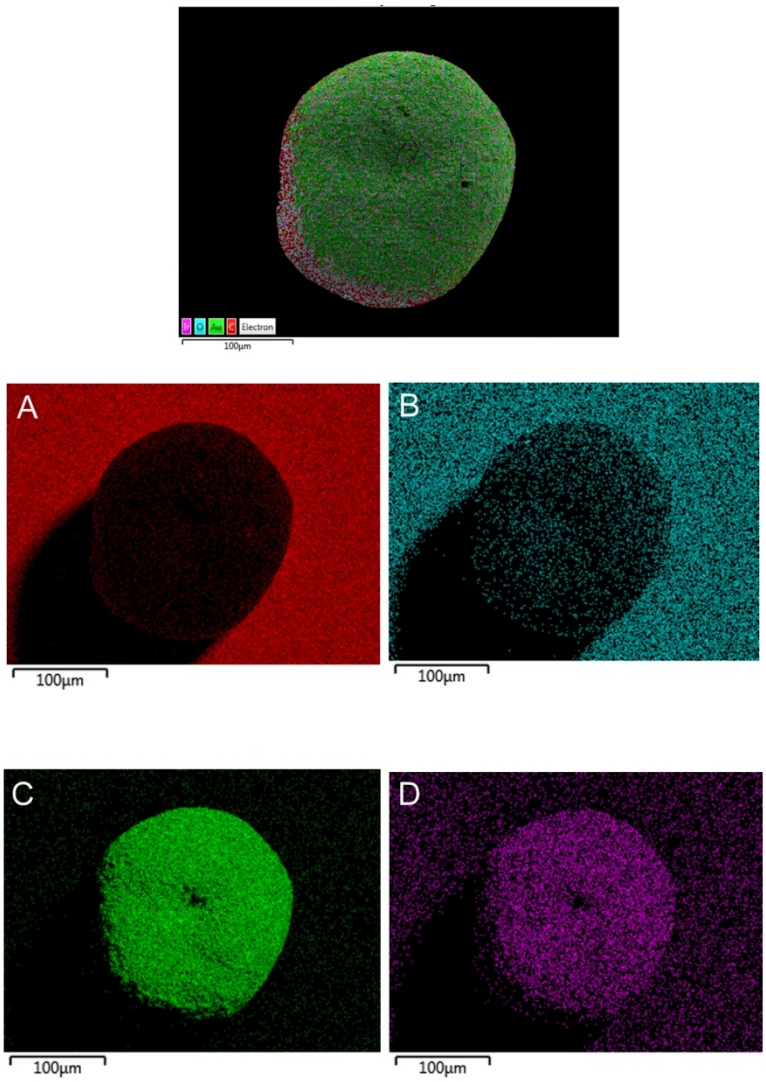

Figure S6 EDS analysis of PMETAC_SH-Au-MCs: (A) C; (B) O; (C) Au; (D) Ir.

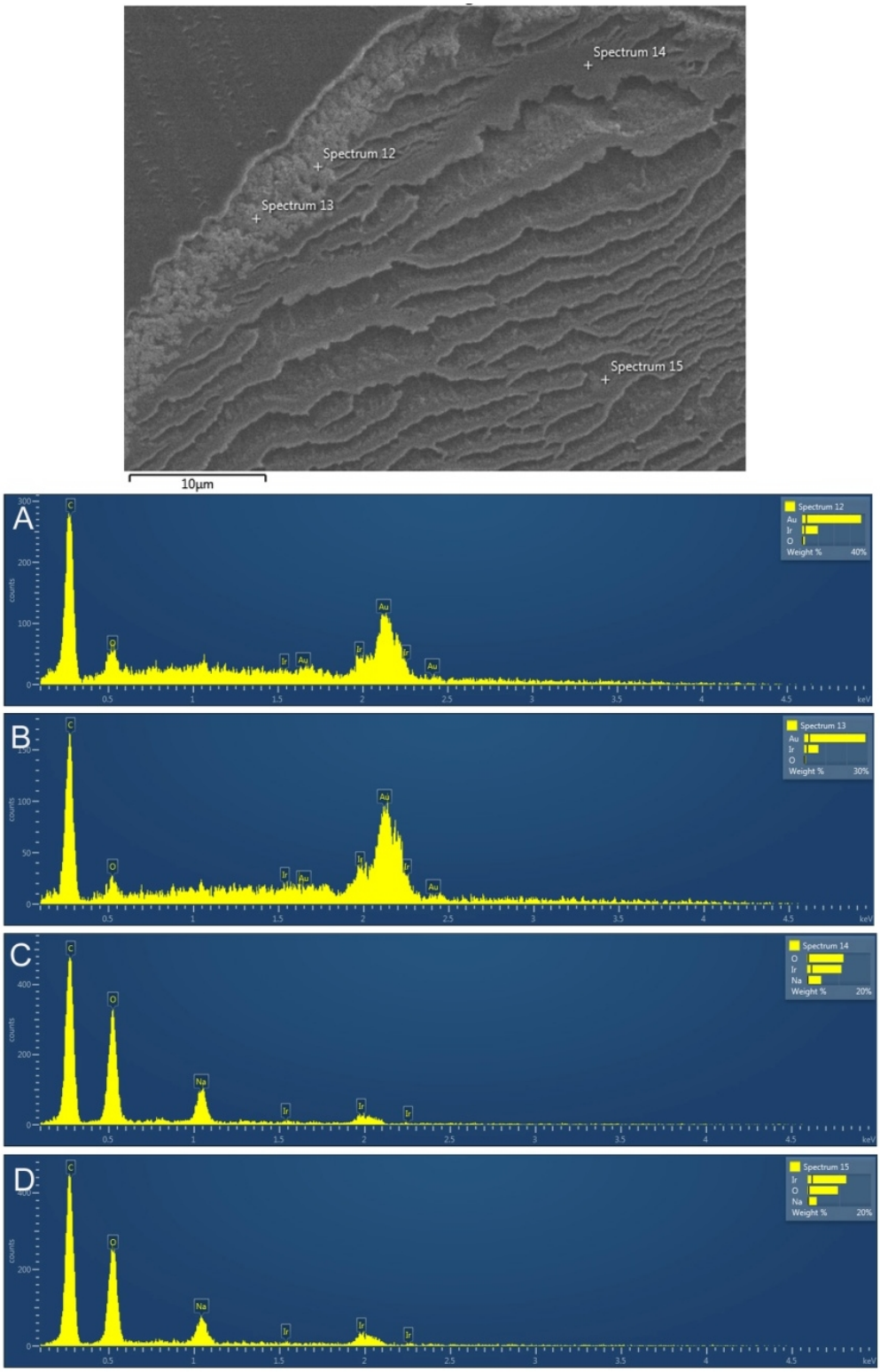

Figure S7 EDS analysis of cross-section of PMETAC-Au-MCs: (A) Spectrum 12; (B) Spectrum 13; (C) Spectrum 14; (D) Spectrum 15.

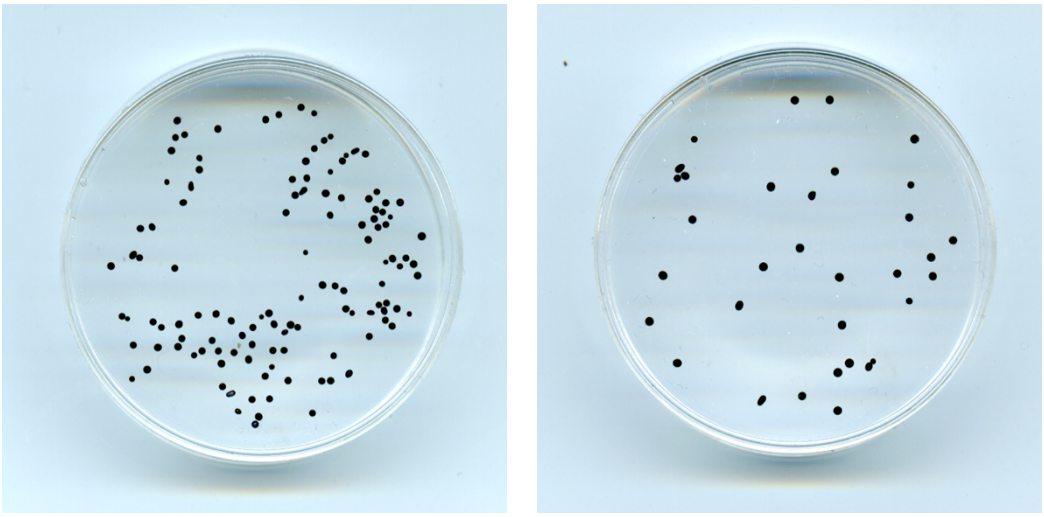

Figure S8 Digital photographs of PMETAC-Au-MCs in saline before (A) and after autoclaving (B).

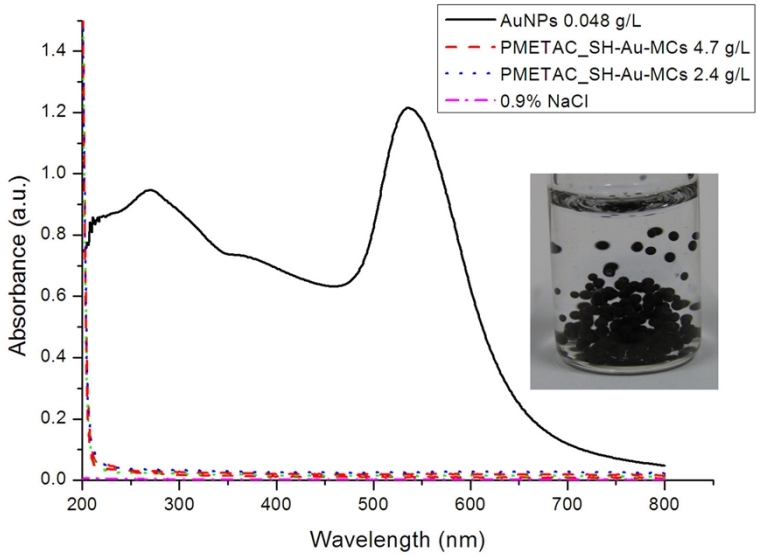

Figure S9 UV-Visible spectra of 0.9% NaCl solution containing MCs prepared with different Au concentrations after shaking for 2 months at 37 ºC, compared with a solution of AuNPs with a concentration of 0.048 g/L. Insert photograph of PMETAC_SH-Au-MCs (4.7 g/L) in 0.9% NaCl solution after shaking at 37 ºC for 2 months.

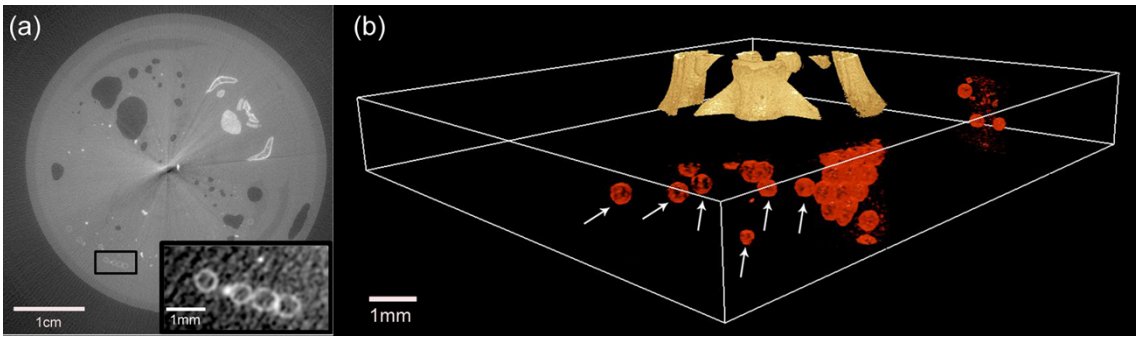

Figure S10 PMETAC_SH-Au-MCs (4.7 g/L) injected into the abdominal cavity of a freshly sacrificed rat showing: CT images of single slices of MCs (magnified in inserts with an adjusted grayscale window) (A) and 3D rendering of 4.3 mm vertical section injected with MCs (pointed by white arrows) (B) scanned at 35 keV.

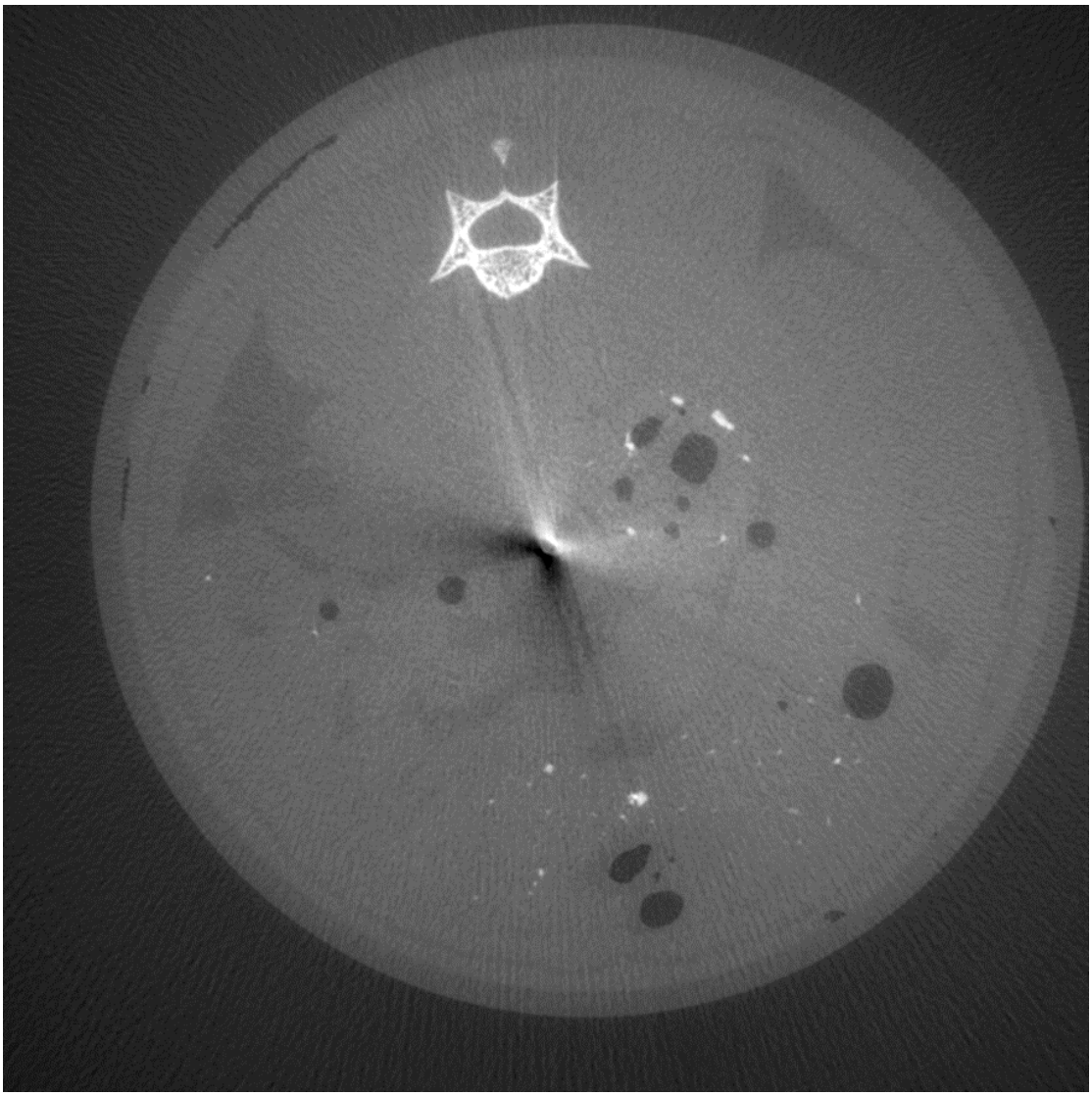

Figure S11 CT image of unlabelled MCs injected into the abdominal cavity of freshly sacrificed rat scanned at 35 keV.

Estimation of PAuNPs loading on MCs

The derivation process for the amount of PAuNPs loaded onto each alginate microcapsule is:

Suppose the side of the regular tetrahedron is x. Then the volume of the regular tetrahedron is $\frac{\sqrt{2}}{12}x^3$. The radius of the inscribed sphere of the regular tetrahedron is $\frac{\sqrt{6}}{12}x$. The volume of the inscribed sphere and the other four spheres, regarding the vertex as the sphere centre, is $(1+\frac{2}{3})\times\frac{4}{3}\pi\left(\frac{\sqrt{6}}{12}x\right)^3$.

The volume ratio of the spheres to the regular tetrahedron is:

$$\frac{\frac{5}{3}\times\frac{4}{3}\pi\left(\frac{\sqrt{6}}{12}x\right)^3}{\frac{\sqrt{2}}{12}x^3}\times 100\% = 50\%$$

The number of microcapsules per mL is

$$\frac{50\%\times 1\,mL}{\frac{4}{3}\pi(250\times 10^{-6})^3\,m^3} = 7643$$

The largest amount of PAuNPs loaded onto the alginate microcapsules is

$$\frac{4.7\,mg/mL\times 1\,mL}{7643} = 0.6\,\mu g\ per\ MC$$

The lowest amount of PAuNPs loaded onto the alginate microcapsules is

$$\frac{0.6\,mg/mL\times 1\,mL}{7643} = 0.08\,\mu g\ per\ MC$$