

Supporting Information

Bismuth@US-tubes as a Potential Contrast Agent for X-ray Imaging Applications

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1. Synthesis of Bi@US-tubes.

The Bi@US-tubes were prepared dissolving 15 mg of BiCl_3 in 15 mL of HPLC water (pH 5.5) in a scintillation vial to produce an opaque white solution of BiOCl (Figure 1S, a). Concentrated HCl was added dropwise to the solution with vigorous stirring until the color changed from white to colorless (Figure 1S, b). US-tubes (15 mg) were added to the solution and then sonicated for 1 hour (Figure 1S, c). The solution was left undisturbed for 24 hours to produce the Bi@US-tubes material (Figure 1S, d). The supernatant solution was removed by decantation. Finally, the Bi@US-tubes were collected by filtration, washed with abundant diluted 1M HCl solution to remove surface adsorbed bismuth ions, and then with abundant DI water (pH 5.5). The resulting Bi@US-tube sample was then dried at 120 °C.

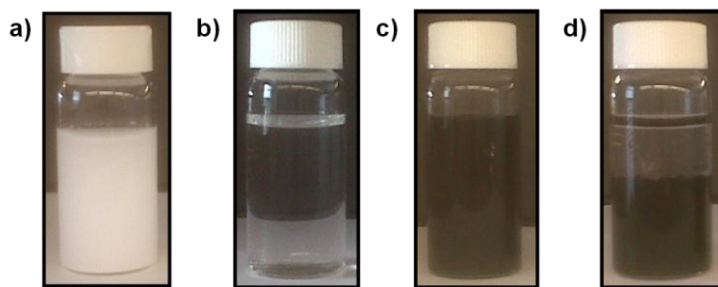


Figure 1S. Synthesis of Bi@US-tubes; **a)** dissolution of BiCl_3 in HPLC water (pH 5.5) to give a white solution, due to formation of BiOCl , **b)** after the addition of concentrated HCl to produce a clear solution, **c)** US-tubes added to bismuth solution and then sonicated for 1 hour, **d)** suspended Bi@US-tubes settled down after 24 hours.

2. Stability profiles from suspensions of the Bi@US-tubes.

The stability of the Bi@US-tubes was determined in a biologically-relevant environment, performing dialysis studies in different media such as phosphate-buffered saline (PBS) and

ethylenediaminetetraacetic acid (EDTA) at 37 °C. Powders of the Bi@US-tubes (10 mg) were suspended in 10 mL of 0.17% (w/v) Pluronic[®] F-108 NF via probe sonication for 6 min. Any unsuspended Bi@US-tubes were removed by centrifugation at 3200 rpm for 10 min. The stability of the Bi@US-tubes was examined by enclosing 10 mL of the Bi@US-tubes suspension inside a dialysis membrane (Slide-A-Lyzer Dialysis Cassette; 20,000 MW) cylinder, which was immersed in buffer solutions containing 6.7 mM PBS (dashed line) and 6.7 mM PBS with 0.01 mM EDTA (solid line) at 37 °C for one week (Figure 2S). Samples in triplicate were obtained from the dialysis-membrane cylinder at different time points (0, 3, 6, 24, 72, and 168 hours) to determine the Bi concentration by ICP-OES.

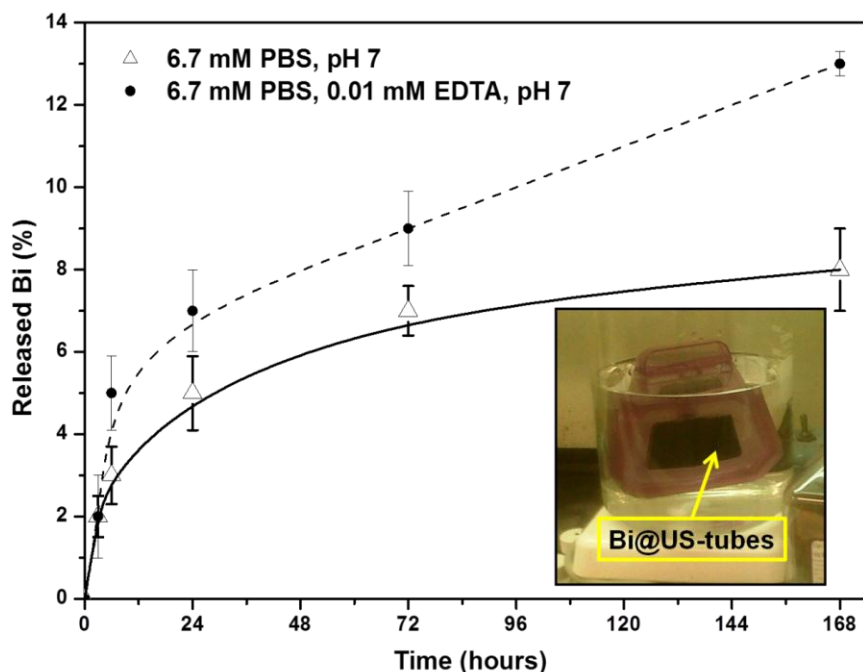


Figure 2S. Stability profiles of Bi@US-tubes suspended in 0.17% (w/v) Pluronic[®] F-108 NF in PBS (solid line with triangle symbols) and EDTA (dashed line with circle symbols) at 37 °C. The data are expressed in mean \pm SD of three independent experiments. Error bars may be smaller than symbols.

3. Radiodensity values from suspensions of the Bi@US-tubes as a function of bismuth concentration within the US-tubes.

Powders of empty US-tubes and Bi@US-tubes were suspended in 0.17% (w/v) Pluronic® F-108 NF in the same way as previously described above in Section 2. Radiodensity values from suspensions of the empty US-tubes and Bi@US-tubes in 1 mL Eppendorf tubes were measured in a clinical X-ray CT scanner at 110 kV (Figure 3S). The attenuation of the Bi@US-tubes varied linearly as a function of bismuth concentration ($r^2 = 0.998$, CT coefficient value = 1079 HU/ mM).

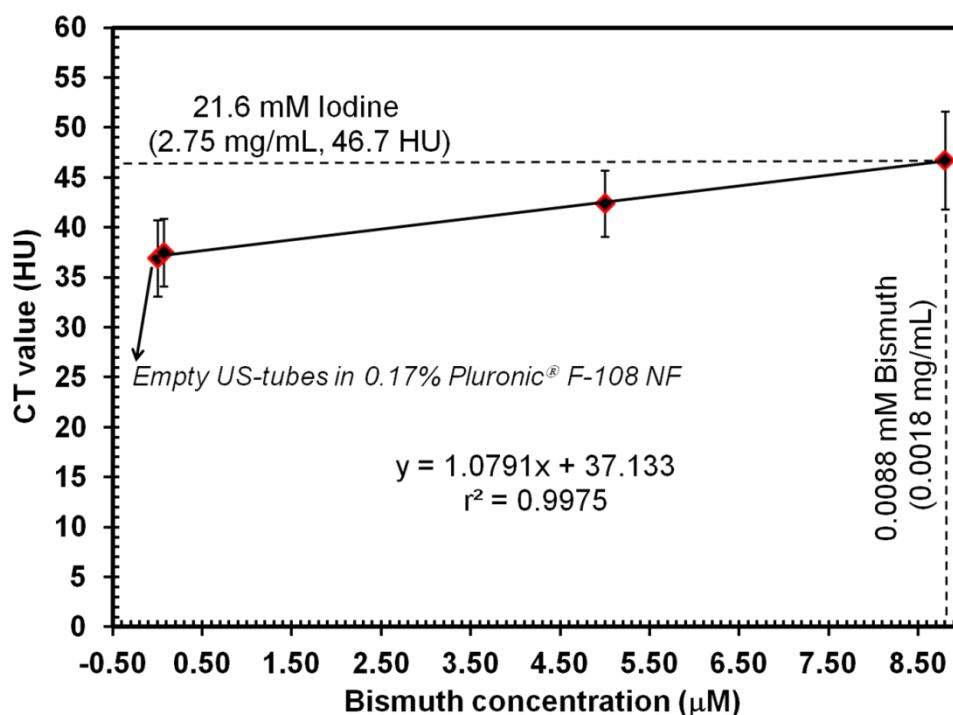


Figure 3S. X-ray attenuation values of Bi@US-tubes in 0.17% (w/v) Pluronic® F-108 NF as a function of bismuth concentration within the US-tubes. The horizontal dashed line represents the concentration of iodine CA (Iopromide) required to achieve an equivalent attenuation that of the Bi@US-tubes. The data are expressed in mean \pm SD for axial, sagittal, and coronal CT views.