

## Supporting Information

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

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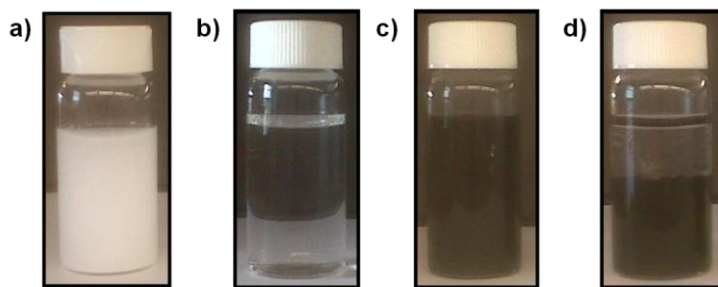
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## 1. Synthesis of Bi@US-tubes.

The Bi@US-tubes were prepared dissolving 15 mg of  $\text{BiCl}_3$  in 15 mL of HPLC water (pH 5.5) in a scintillation vial to produce an opaque white solution of  $\text{BiOCl}$  (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.

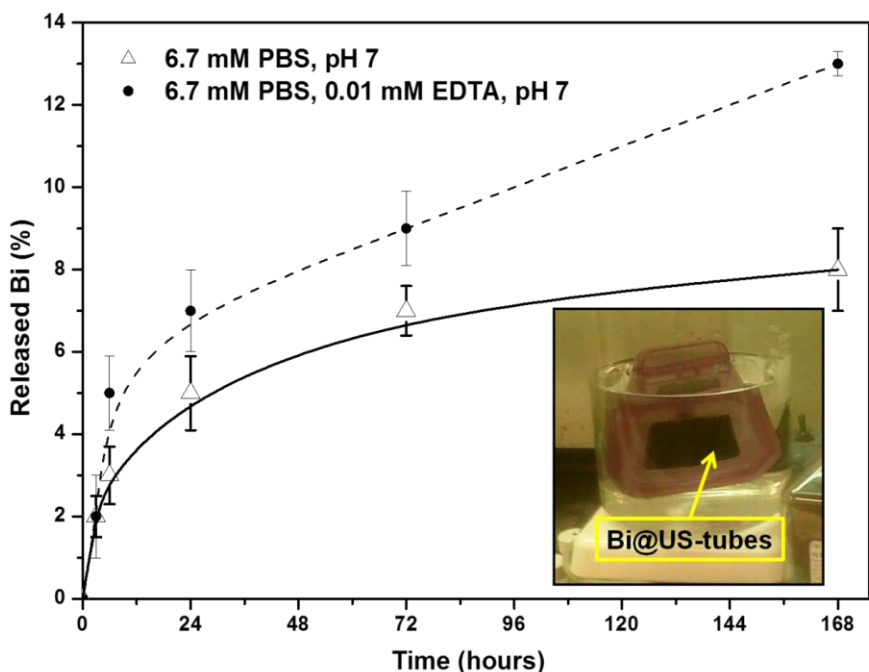


**Figure 1S.** Synthesis of Bi@US-tubes; **a)** dissolution of  $\text{BiCl}_3$  in HPLC water (pH 5.5) to give a white solution, due to formation of  $\text{BiOCl}$ , **b)** after the addition of concentrated HCl to produce a clear solution, **c)** US-tubes added to bismuth solution and then sonicated 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

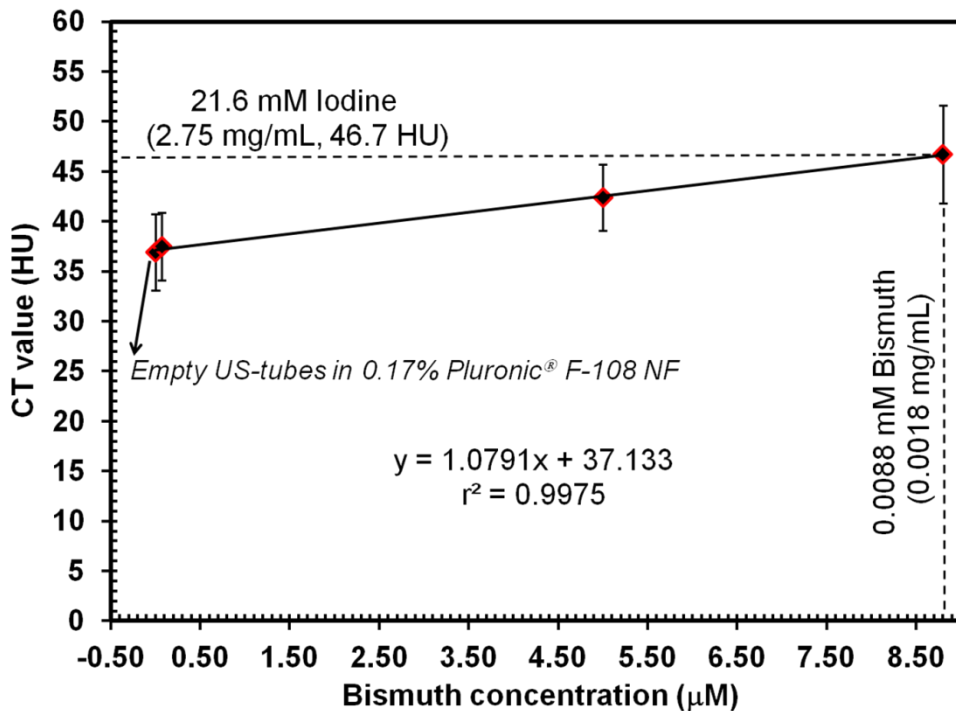
ethylenediaminetetraacetic acid (EDTA) at 37 °C. Powders of the Bi@US-tubes (10 mg) were suspended in 10 mL of 0.17% (w/v) Pluronic<sup>®</sup> F-108 NF via probe sonication for 6 min. Any unsuspended Bi@US-tubes were removed by centrifugation at 3200 rpm for 10 min. The stability of the Bi@US-tubes 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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.