Supporting information for

Utilizing Polymer-Conjugate Albumin Based Ultrafine Gas Bubbles in Combination with Ultra-

High Frequency Radiations in Drug Transportation and Delivery







Optical spectrum measurement

Figure S2. Absorbance spectra of sample without bubbles (_____) and sample without bubbles after centrifugation (_____) in (a) physiological salt solution, (b) HSA solution, and (c) PEG/HSA solution.



Figure S3. i. Quercetin adsorption isotherm in different solvated systems (a) PEG/HSA solution, and (b) HSA solution. ii. The change in surface tension in turn PEG (+PEG), HSA (+HSA), quercetin addition (+Q), bubble presence (+BB), and after release by HFA (+HFA) with corresponding solvated quercetin concentration in the bulk at different conditions (initial addition, +BB, and +HFA) in (a) PEG/HSA solution and (b) HSA solution. The quercetin concentrations were estimated from surface tension values and corresponding isotherm with specific solution.

HSA concentration determination

To investigate the germane concentration of HSA in this study, the surface tension as a function of HSA concentration was examined. A set of surface tension experiments was conducted using the Wilhelmy plate method with HSA concentration in the range of 0.003- 0.1

mg/mL. The result was demonstrated as a plot of surface tension at different HSA concentrations and the preferred concentration was chosen based on this plot.



Figure S4. Dependence of surface tension on HSA concentration.



Figure S5. Absorbance spectra of sample without bubbles (____), sample with bubbles (____) and sample with bubbles after centrifugation (____) in (a) physiological salt solution and (b) HSA solution. The spectra of sample with bubbles compose the adsorption spectrum of sample with bubbles.

Fluorescence laser imaging

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Figure S6. Fluorescence laser images under the 405 nm laser irradiation of i. Sample without bubble, ii. Sample with bubbles, and iii. Sample with bubbles after centrifugation in (A) physiological salt solution, (B) HSA solution, and (C) PEG/HSA solution.



Figure S7. Red color intensity of sample with bubbles before and after release. Inset: the scattered images under the 405 nm laser irradiation of sample with bubbles i. before release and ii. after release.