Supporting Information

Porous Organosilica Nanoparticles Enable UV Blocking and Two-Photon Fluorescence Imaging

Aleksandra Pavlović,[a] Irena Miler,[a] Marta Bukumira,[b] Marko Milojević,[c,d] Branislav Jović,[e] Mihailo D. Rabasović,[b] Nikola Ž. Knežević [a]**

a. BioSense Institute, University of Novi Sad, Dr Zorana Đindjica 1, 21000 Novi Sad, Serbia.

b. Institute of Physics Belgrade, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia.

c. University of Maribor, Faculty of Medicine, Institute of Biomedical Sciences, Taborska ulica 8, SI-2000, Maribor, Slovenia

d. University of Maribor, Faculty of Medicine, Department of Pharmacology, Taborska ulica 8, SI-2000, Maribor, Slovenia

e. Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, University of Novi Sad, Trg Dositeja Obradovića 3, 21000 Novi Sad, Serbia.

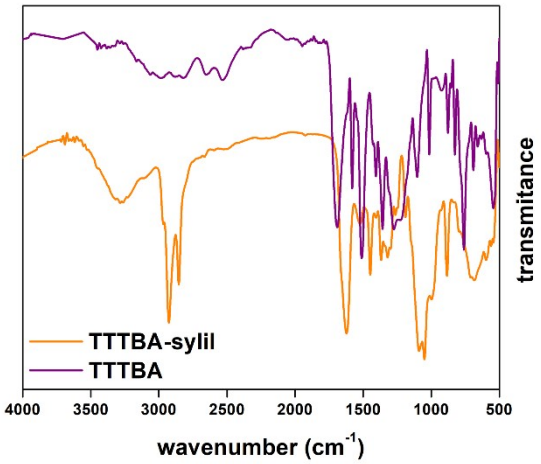


Figure S1. FTIR spectra of silane precursor (TS) and starting compound (TTTBA)

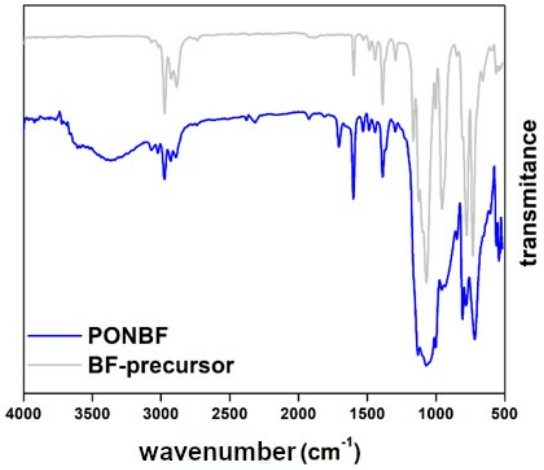
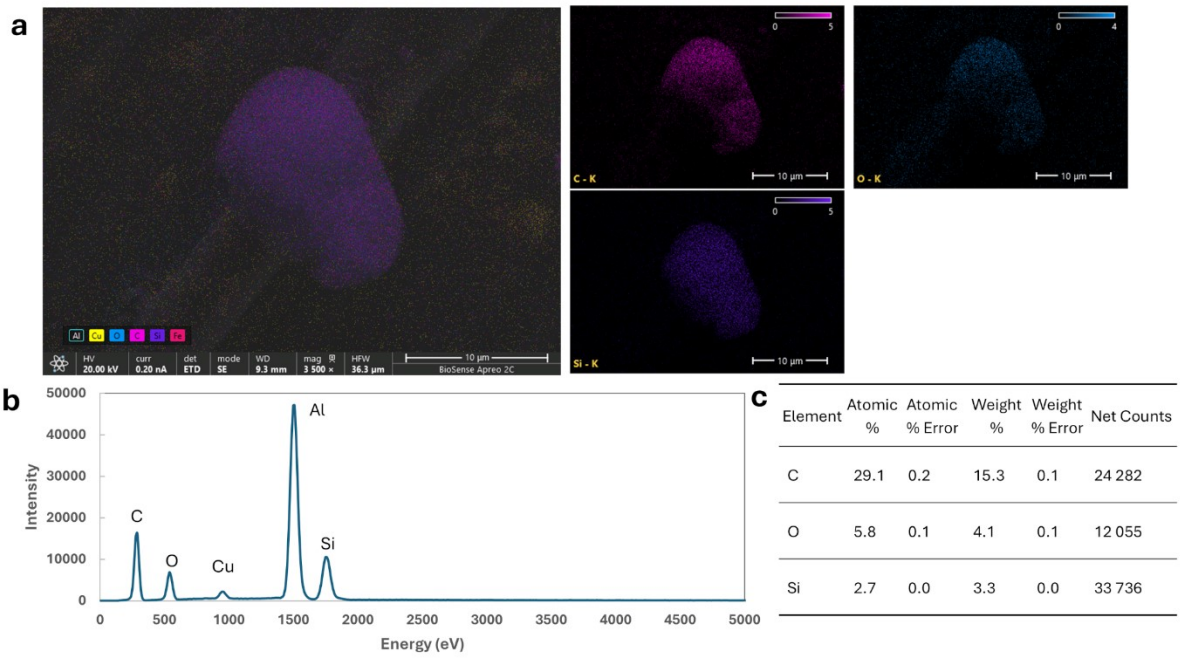


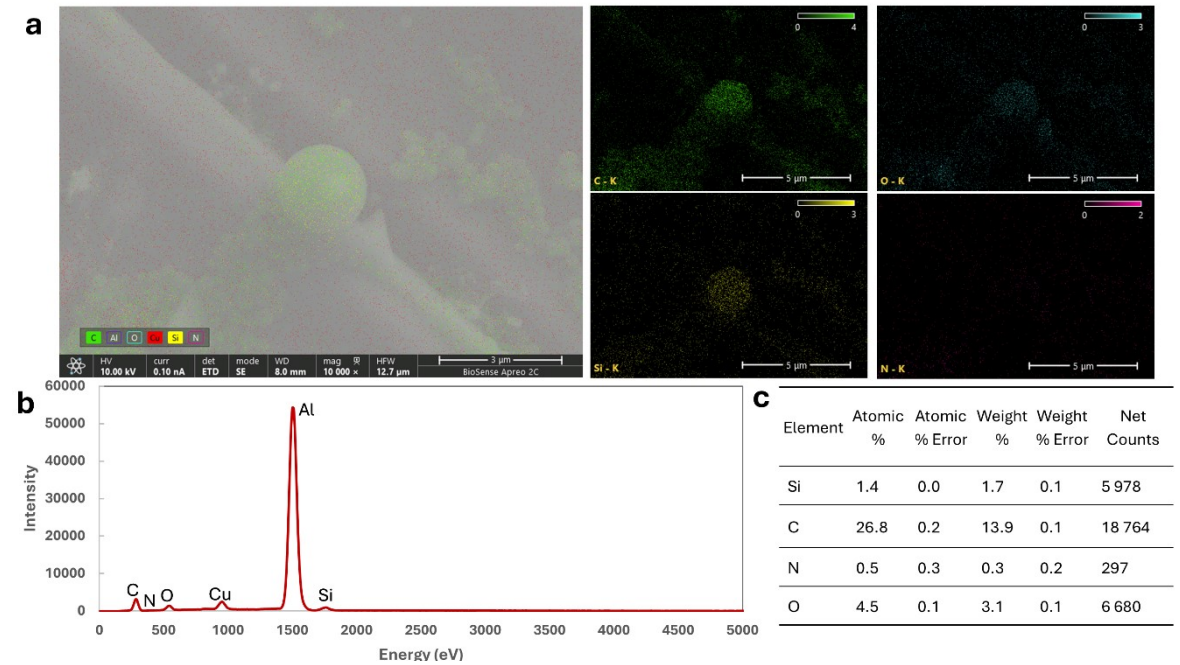
Figure S2. FTIR spectra of PONBF nanoparticle and its precursor molecule BF. The Spectra show presence of aromatic C-C and Si-O vibrations indicating successful synthesis of particles from organosilane precursor.



c

Element	Atomic %	Atomic % Error	Weight %	Weight % Error	Net Counts
C	29.1	0.2	15.3	0.1	24 282
O	5.8	0.1	4.1	0.1	12 055
Si	2.7	0.0	3.3	0.0	33 736

Figure S3. EDX of PONBF. EDX spectrum (b) and element weight percent (c) of PONBF nanoparticles. Parameters: total number of counts: 2 195 880, average count rate: 6 965 cps, acceleration voltage: 20 kV, total acquisition time: 304 seconds



c

Element	Atomic %	Atomic % Error	Weight %	Weight % Error	Net Counts
Si	1.4	0.0	1.7	0.1	5 978
C	26.8	0.2	13.9	0.1	18 764
N	0.5	0.3	0.3	0.2	297
O	4.5	0.1	3.1	0.1	6 680

Figure S4. EDX of PONBFTS20%. EDX spectrum (b) and element weight percent (c) of PONBFTS20% nanoparticles. Parameters: total number of counts: 585 390, average count rate: 1763 cps, acceleration voltage: 10 kV total acquisition time: 304 seconds

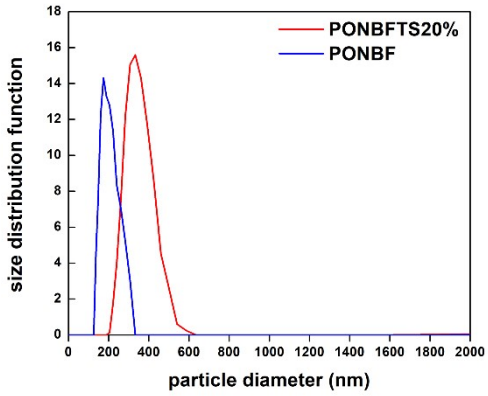


Figure S5. DLS showing the particle size distribution of both nanoparticle formulations,

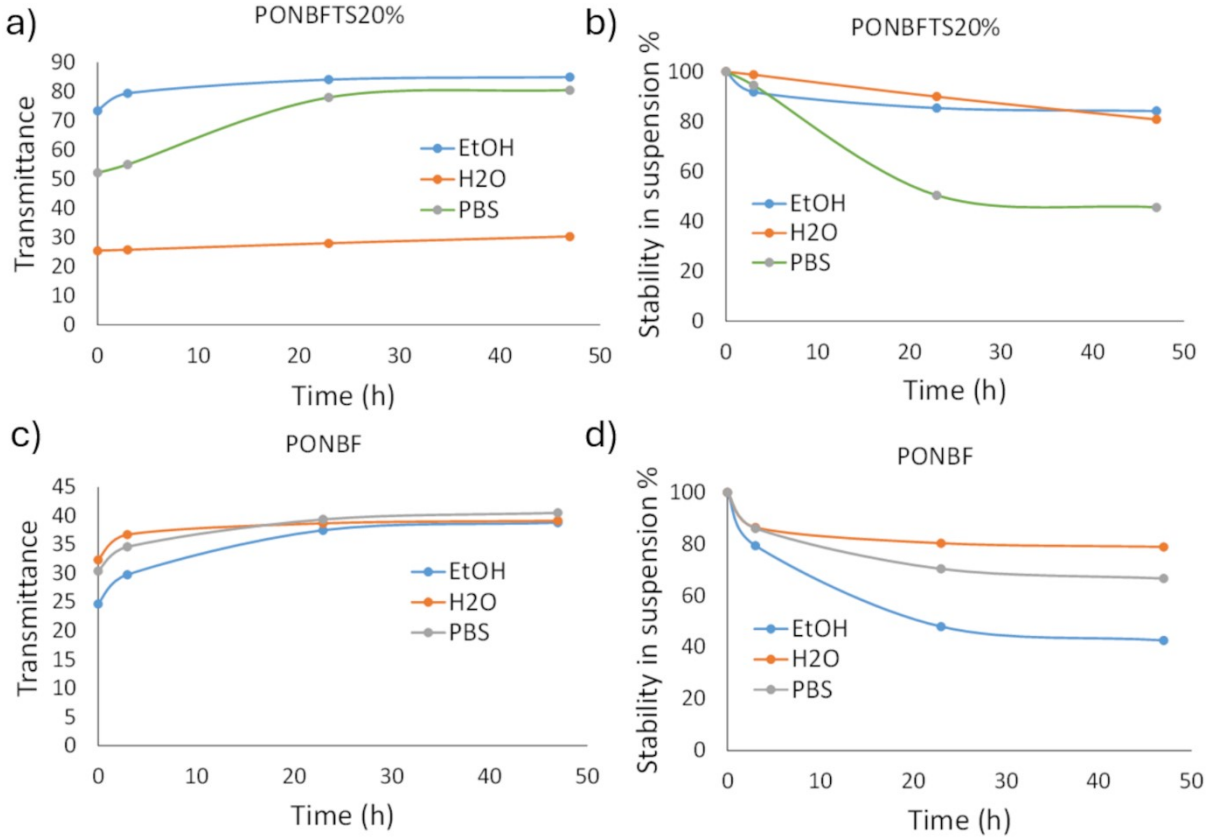


Figure S6. Measurements of transmittance of suspension of PONBFTS20% (a) and PONBF (c) at a concentration of 0.05 mg mL^{-1} in the ethanol, miliQ water and PBS solution for the duration up to 47 h. The stability of suspensions is represented on panels (b) and (d) for PONBFTS20% and PONBF, respectively; % of stability in suspension is normalized for each suspension to the transmittance value at 0 h.

Synthesized materials were dispersed in absolute ethanol (0.05 mg/ml) and measured using UVVIS spectrometry. Absorbance values in wavelength range 290-320 nm were employed to Mansur equation (S6) in order to determine SPF factor. (1)

$$SPF_{spectrophotometric} = CF \times \sum_{290}^{320} EE\ (\lambda) \times I(\lambda) \times Abs\ (\lambda)$$ **Equation S1**

CF is the correction factor (=10), EE (λ) erythemal effect spectrum, I (λ) solar intensity spectrum, Abs (λ) absorbance of the solution. The values of EE and I are constants, determined by Sayre et. al. (1)

The critical wavelength (Equation S7) and UVA/UVB (Equation S8) ratios were determined from the UV/VIS spectra by fitting the most accurate approximation functions ($R^2 > 0.99$) using Microsoft Excel:

$$\int_{290}^{\lambda c} A\ (\lambda) d\lambda = 0.9 \int_{290}^{400} A\ (\lambda) d\lambda$$ **Equation S2**

$$\frac{UVA}{UVB} ratio = \frac{\int_{320}^{400} A\ (\lambda) d\lambda / \int_{320}^{400} d\lambda}{\int_{290}^{320} A\ (\lambda) d\lambda / \int_{290}^{320} d\lambda}$$ **Equation S3**

where λc is the critical wavelength, A(λ) is the average absorbance at each wavelength, and dλ is the wavelength interval between measurements.

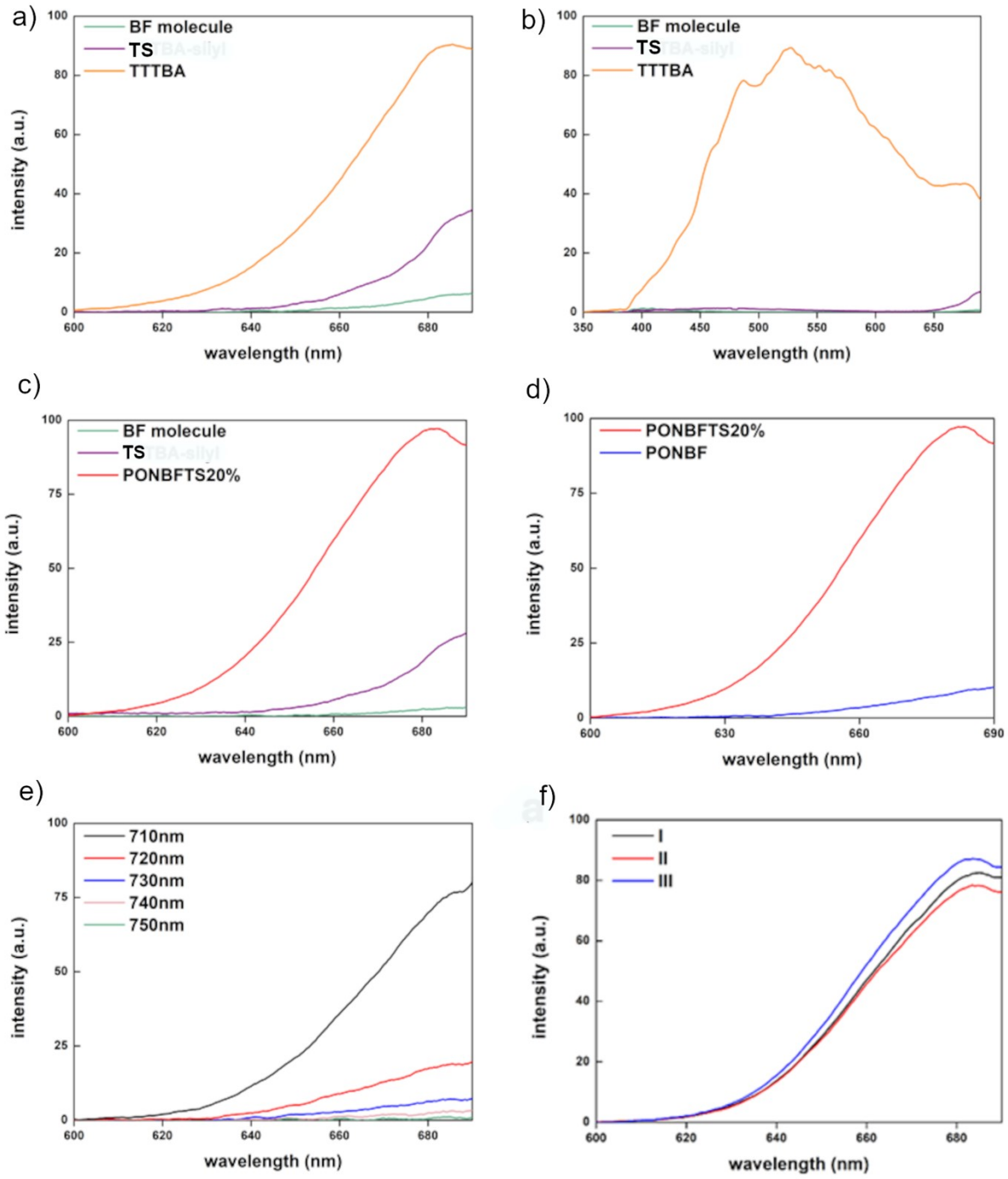


Figure S7 Spectra of starting molecule (TTTBA) and precursors (TS and BF). Excitation 720nm, laser power 5mW at a) continuous wave (CW(excitation, and b) femtosecond pulse (FP) excitation; c) CW mode spectra of PONBFTS20% and its precursors at the same laser power (5mW) d) Comparison of the fluorescence of PONBFTS20% and PONBF under CW excitation wavelength 720nm, laser power 5mW; e) Fluorescence of PONBFTS20% as a function of CW excitation wavelength; f) Photostability, laser power 2.5 mW (I, II; and III indicate spectra after each excitation, I-20s, II-40s,III-60s).

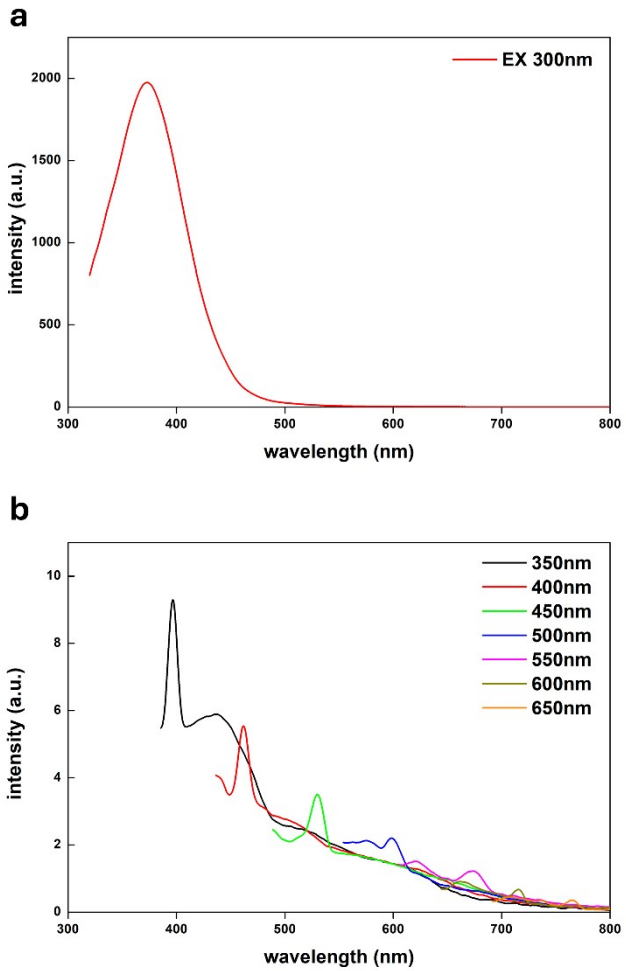


Figure S8 Spectrofluorimetric measurements for PONBFTS20%. a) Excitation wavelength 300nm.b) Spectra normalized by intensity, excitation wavelengths ranging 350 to 700 nm.

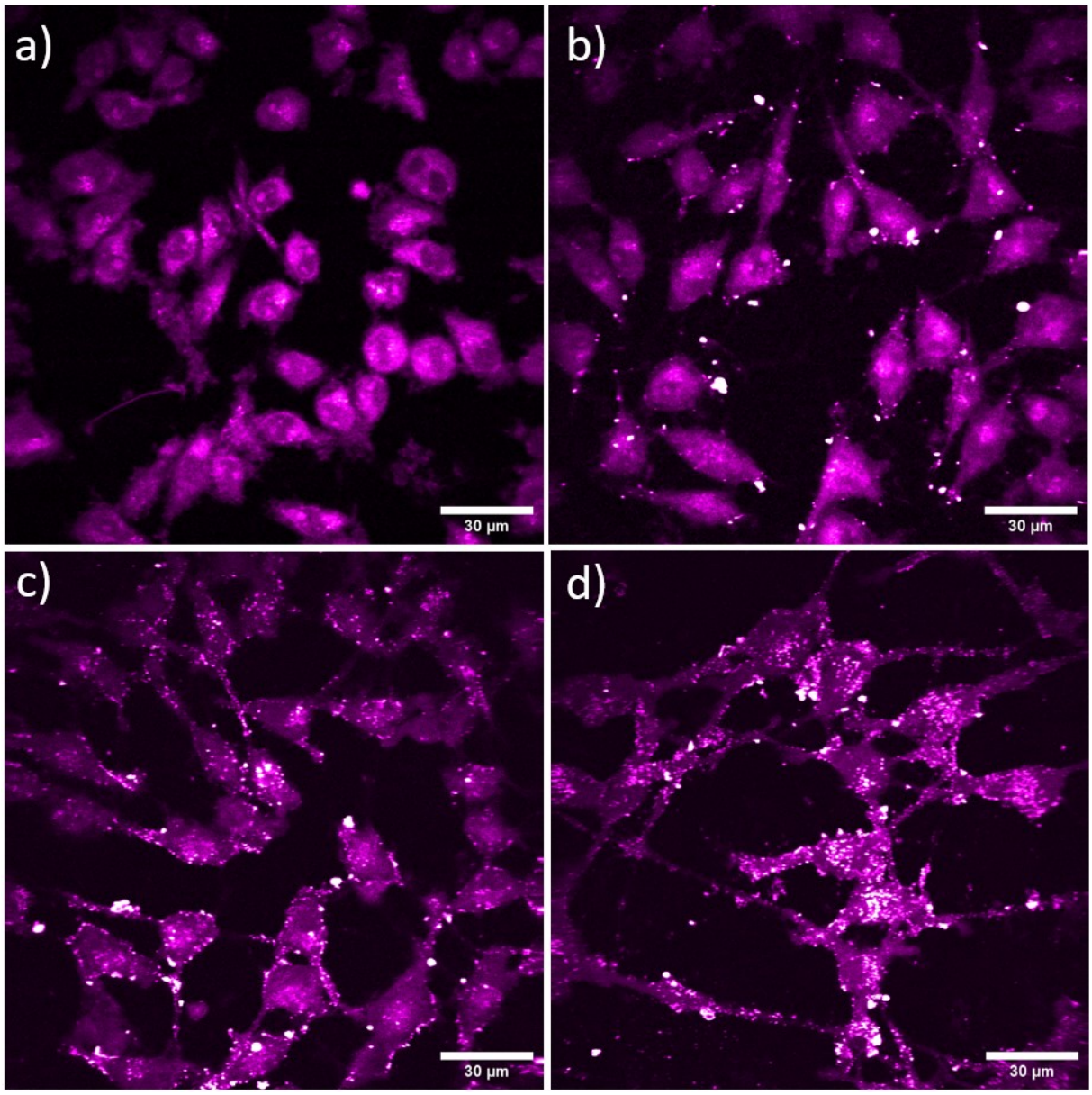


Figure S9. a) Representative TPEF microscopy images of U87 cells, and after b) 1 h, c) 4 h and d) 24 h of incubation with 0.1 mg/mL of BFTS20%, nanoparticles (excitation: 730 nm; laser power: 6.5 mW, 4.9 mW, 5.1 mW, and 5.3 mW for a, b, c, and d, respectively, using 700 nm short-pass filter (FESH0700, Thorlabs) as an emission filter.

SI references:

(1) R. M. Sayre, P. P. Agin, G. J. LeVee, E. Marlowe, *Photochem. Photobiol.* **1979**, *29*, 559.