Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information*

CLPFFD-PEG Functionalized NIR-absorbing Hollow Gold Nanospheres and Gold Nanorods Inhibit *ß*-Amyloid Aggregation

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Experimental section

Thermal experiments

Themography images were obtained from the interaction of Ab with and without gold nanoparticles. Gold nanoparticles and Ab were obtained as previously reported in the experimental part of the manuscript. The thermographs were obtained every 5 minutes of irradiation with an 808 nm, 450 mW continuous laser. The maximum temperature reached was 42°C. In order to compare the irradiation process with environmental temperature, a bath was heated to 42°C and the samples were incubated for 2 h. Immediately, the samples of both experiments were placed in a thermomixer for 48 h at 37°C and 300 rpm. To detect Aβ the thioflavin-T assay was performed and the samples were placed in a black 382-well plate with 0.5 M glycine buffer a pH 8.4 and 0.1 M thioflavin-T as previously described in the experimental section of the manuscript.

*Parts of the data shown here are also content of the supplementary data of Ref. [Ruff. Nanomedicine, 2107]

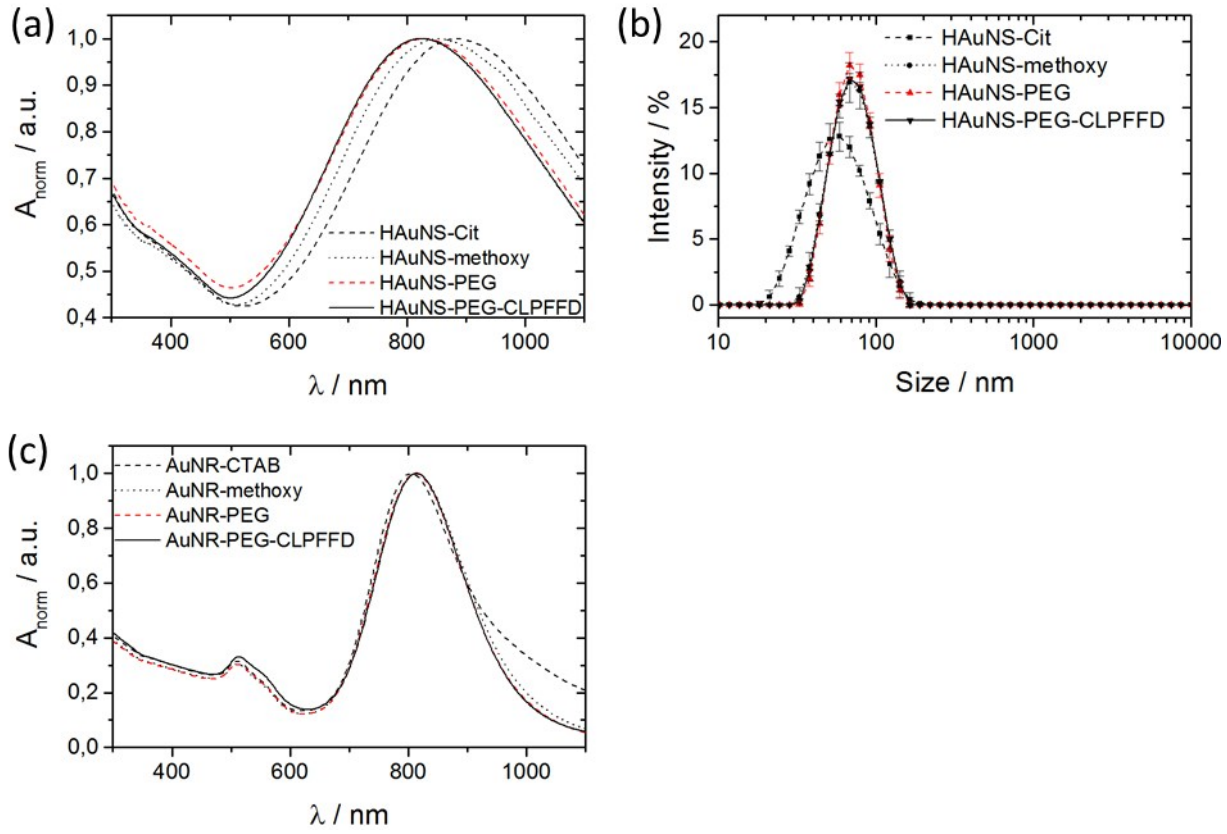

Figure S1 – Indirect functionalization of HAuNS (Batch 1) and AuNR with CLPFFD peptides. (a) Absorbance spectra of HAuNS, (b) absorbance spectra of HAuNS and (c) intensity weighted hydrodynamic diameter of HAuNS.

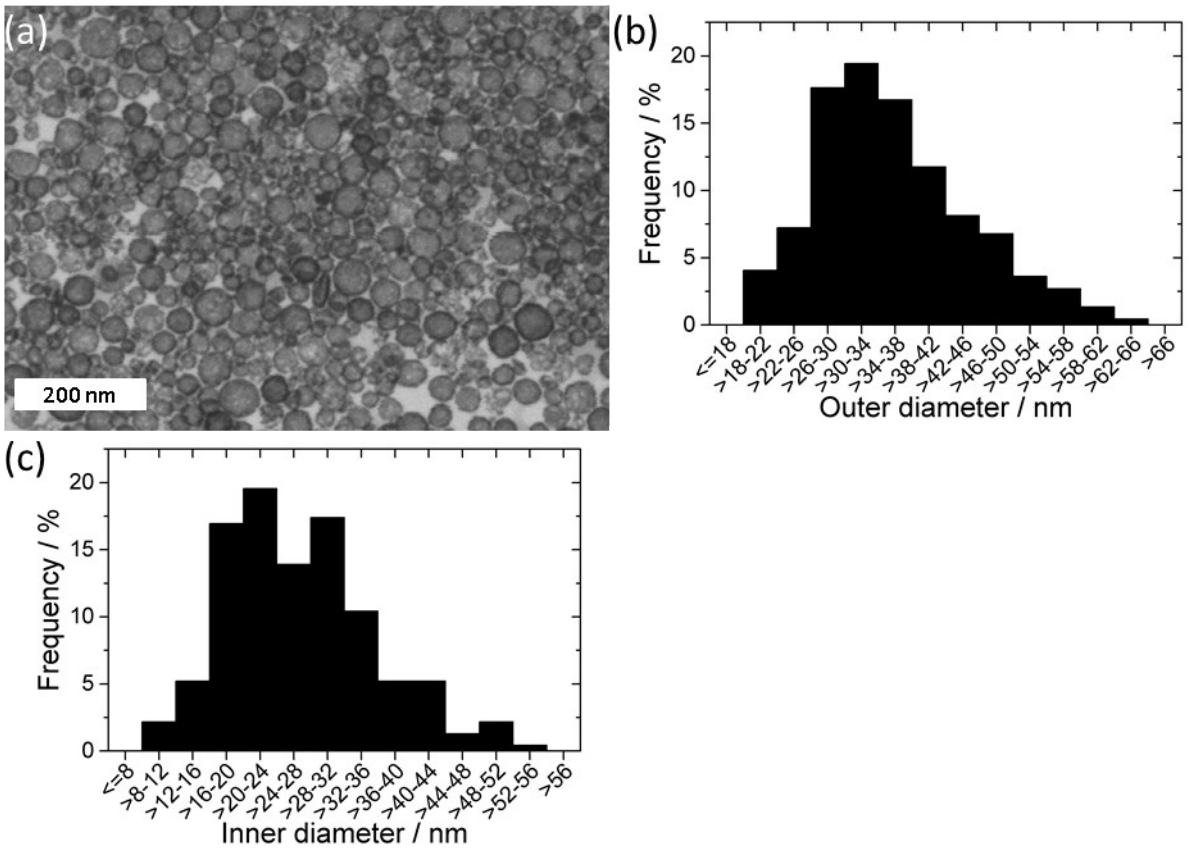

Figure S2 – SEM-T Characterization of HAuNS-PEG-CLPFFD. (a) SEM-T image. Histogram of the (b) outer diameter with a d_o = 36 ± 9 nm and (c) inner diameter with a d_i = 27 ± 8 nm.

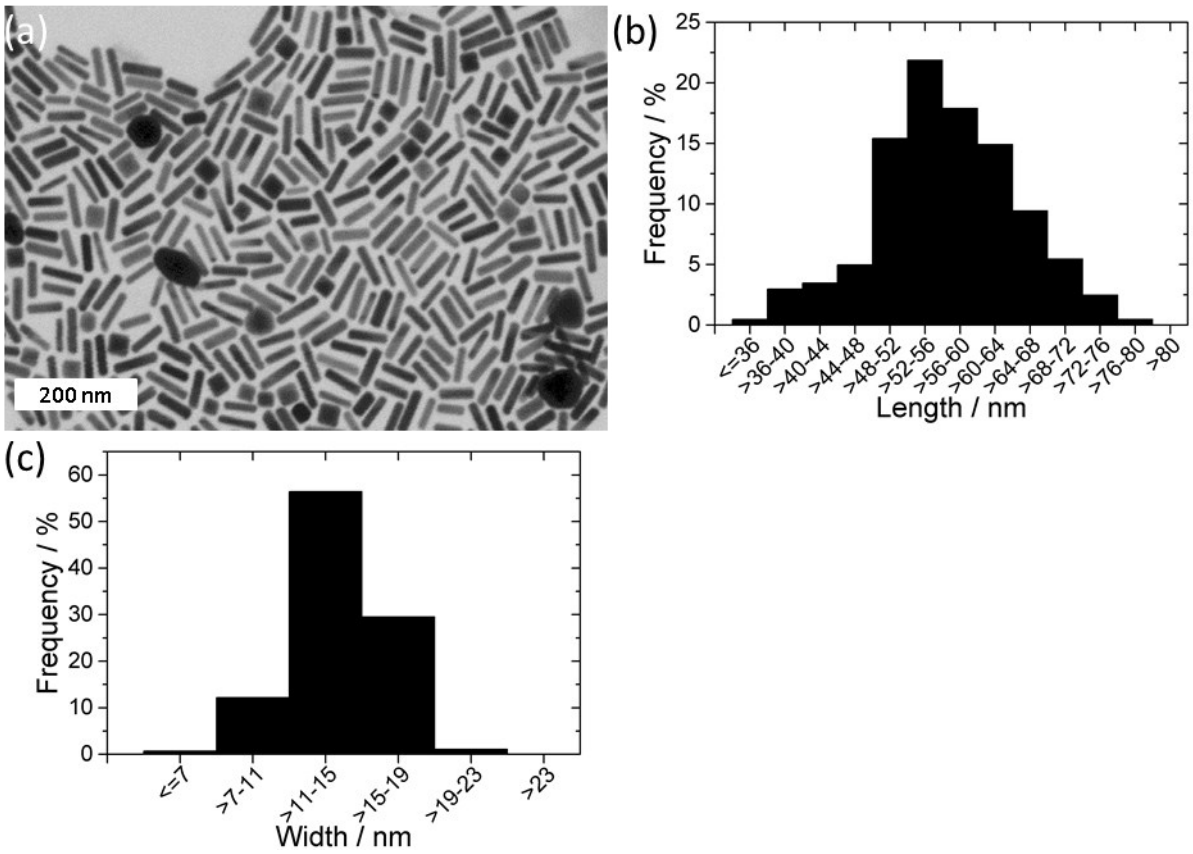

Figure S3 - SEM-T Characterization of AuNR-PEG-CLPFFD. (a) SEM-T image. Histogram of the (b) length with a $d_l = 60 \pm 9$ nm and (c) a width with a $d_w = 14 \pm 3$ nm.

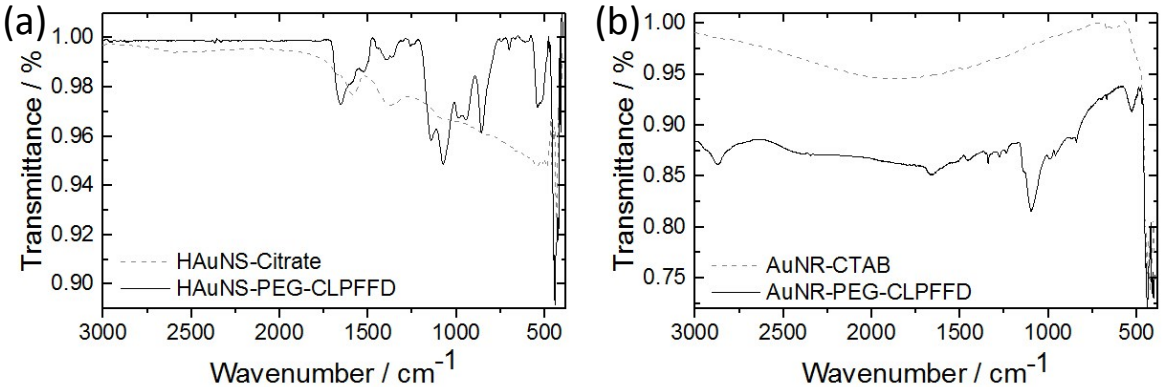

Figure S4 – IR-spectra of (a) HAuNS-Citrate and HAuNS-PEG-CLPFFD and (b) AuNR-CTAB and AuNR-PEG-CLPFFD with in both cases the expected bands for the peptide at 2850-2960 (stretching vibration of the CH_2 and CH_3 group), 1632 (amide I band), 1560 (amide II band) and 1384 and 1269 (aromatic in plane bending vibration) cm^{-1}.

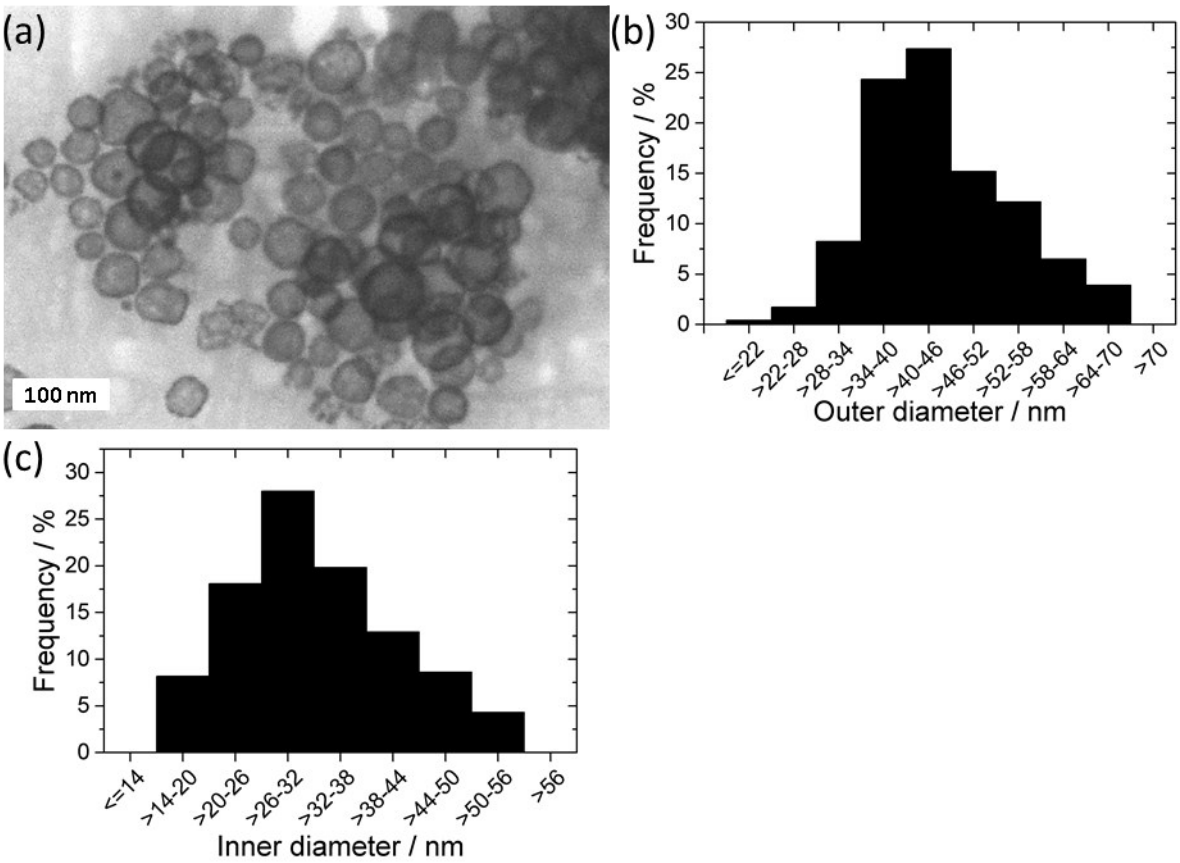

Figure S5 – Direct functionalization of HAuNS with CLPFFD peptides: HAuNS-CLPFFD. (a) SEM-T image. Histogram of the (b) outer diameter with a d_o = 45 ± 10 nm and (c) inner diameter with a d_i = 32 ± 9 nm.

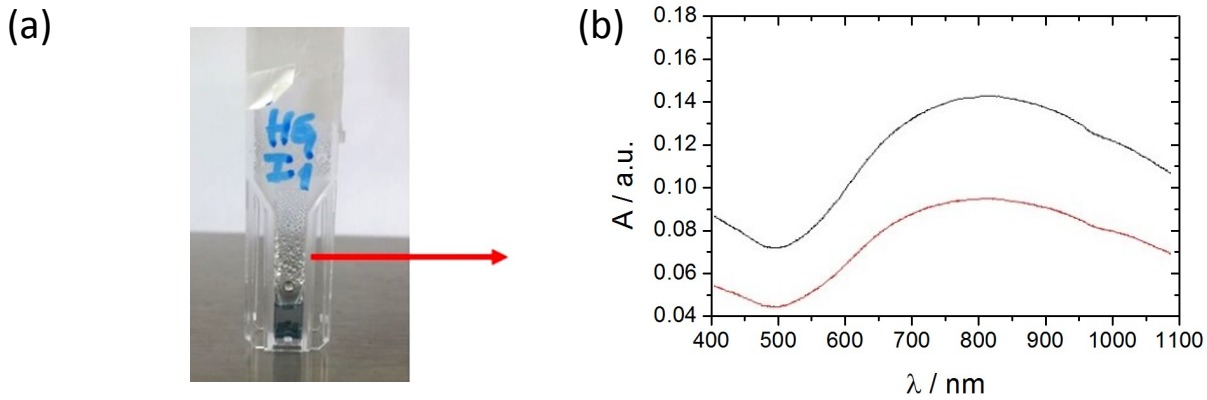

Figure S6 – Effect of NIR-irradiation on HAuNS. (a) Sample of HAuNS-CLPFFD in PBS-Buffer irradiated with an 808 nm, 450 mW continuous laser for 2 h. (b) OES of HAuNS-CLPFFD irradiated (black line) and non-irradiated (red line). The effect of irradiation on the HAuNS was evaluated by the example of HAuNS-CLPFFD because it is known from literature that the irradiation of HAuNS with high laser intensities can lead to the conversion of NIR-absorbing HAuNS to shorter wavelengths-absorbing HAuNS or the breakdown of NIR-absorbing HAuNS into solid AuNS.[1,2] 2 h of NIR-irradiation with an 808 nm, 450 mW continuous laser increased considerably the temperature until evaporation of water as observable in Figure S6a. In the OE spectra (Figure S6b), only a slight decrease of the absorbance but no blue shift is noticeable which indicate the stability of the HAuNS in the used

set-up. Based on the extinction coefficient of the HAuNS, calculations have shown that still 70 % of the initially present HAuNS-CLPFFD concentration contributes to the observed OE spectra.

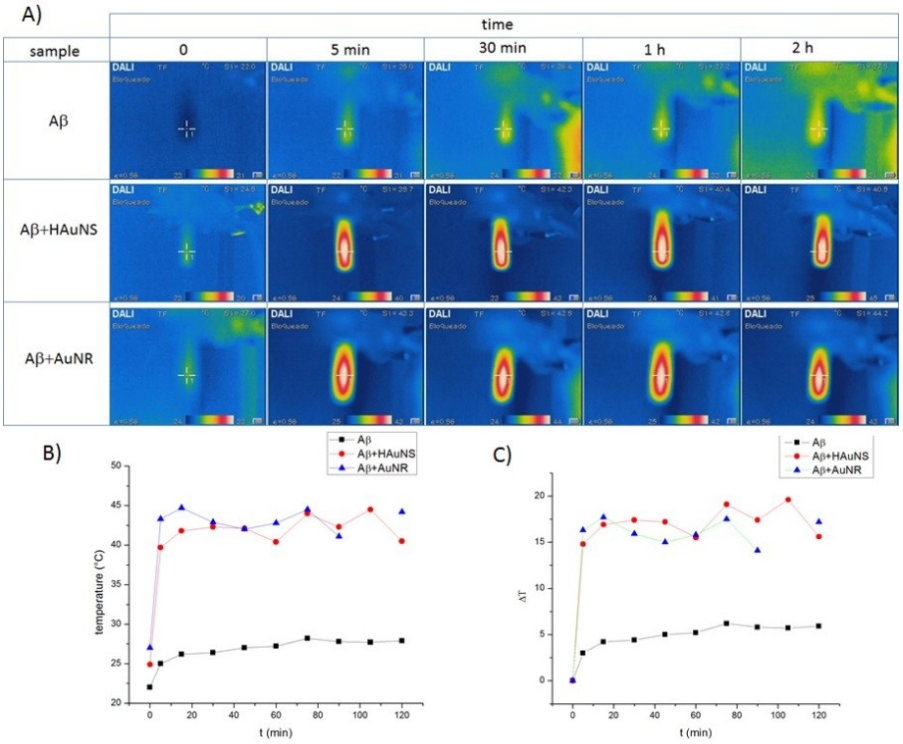

Figure S7 – A) Thermal images of Aβ in absence and presence of AuNNR and HAuNS from 0 h to 2 h of irradiation (808 nm 450 mW continuous laser). B) Graphical representation of Figure S7A, increased temperature vs time. C) Graphical representation of S7A related to ΔT.

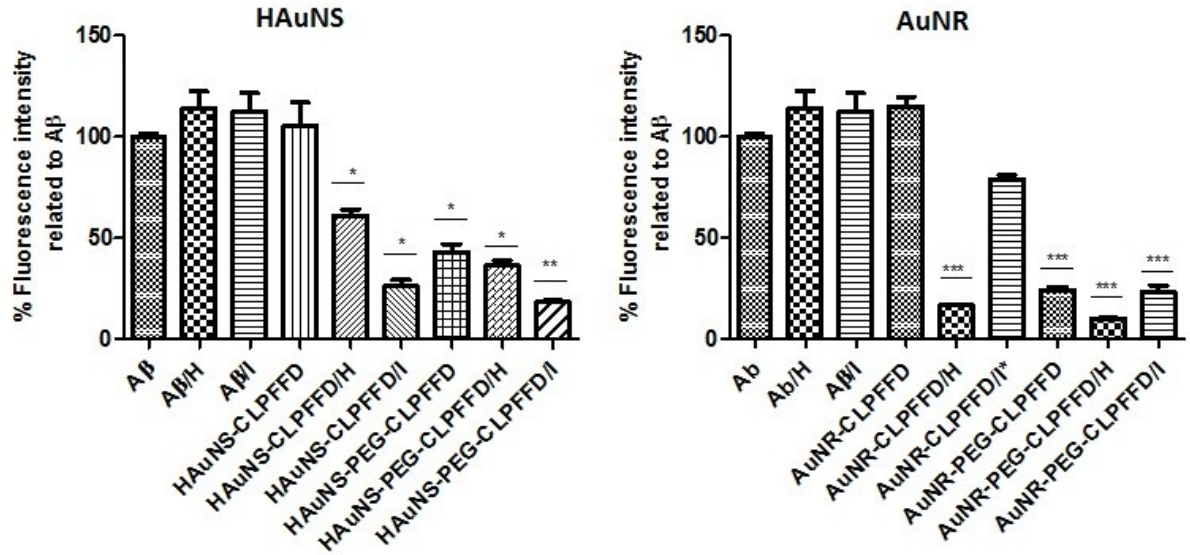

Figure S8 –Comparison between irradiated (I) and heated in a bath (H) samples in presence and absence of HAuNS and AuNR. Differences are statistically significant related to Aβ control: ***P ≤ 0.001

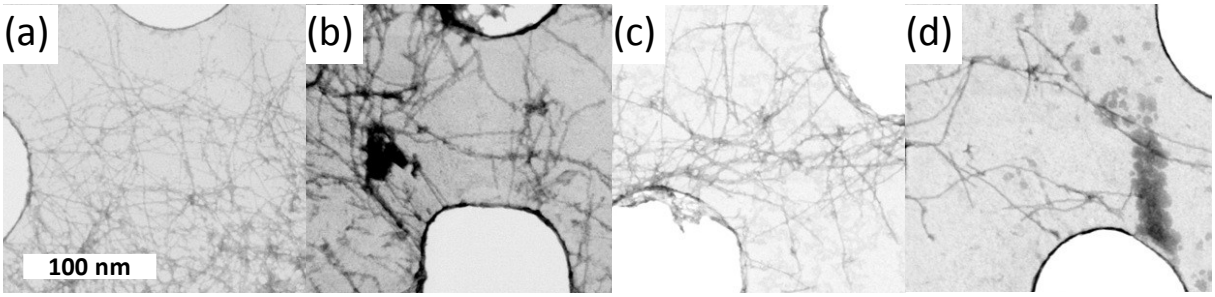

Figure S9 – Inhibitory effect of unbound CLPFFD-peptide on *Aβ* fibril formation: TEM characterization. TEM images of *Aβ*-PIAA incubated in the presence of different concentrations of CLPFFD-peptide: (a) 0 μM, (b) 1 μM, (c) 50 μM and (d) 100 μM.

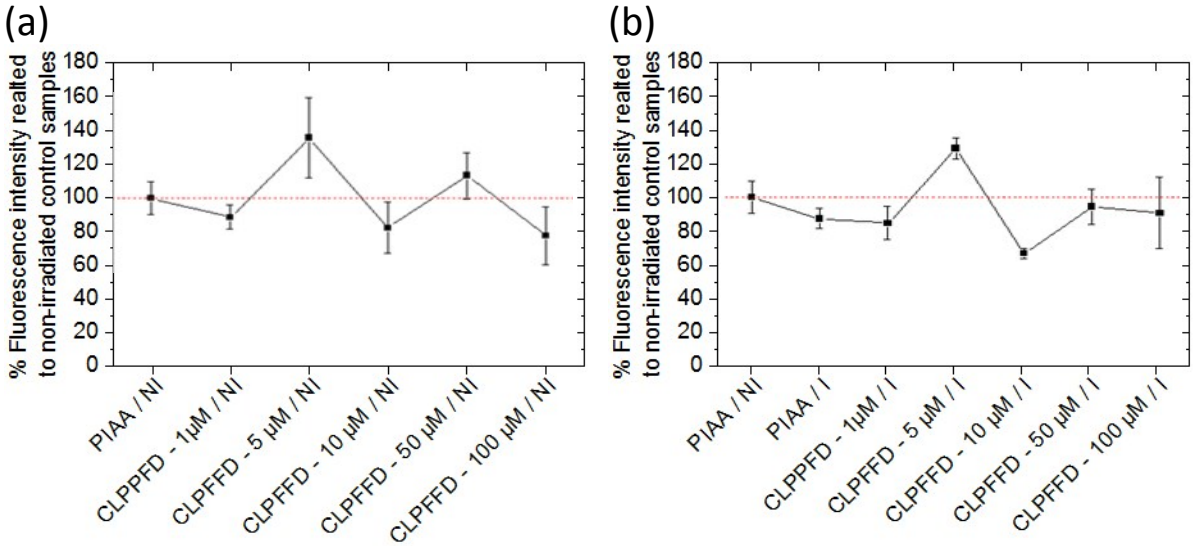

Figure S10 – Inhibitory effect of unbound CLPFFD-peptide on *Aβ* fibril formation: thioflavin-T characterization. Results from the thioflavin-T assay of (a) non-irradiated samples and (b) irradiated samples. The lines are drawn to guide the eyes.

References

[1] B. G. Prevo, S. A. Esakoff, A. Mikhailovsky, J. A. Zasadzinski, *Small* **2008**, *4* (8), 1183–1195P.

[2] D. A. Wheeler, R. J. Newhouse, H. Wang, S. Zou, J. Z. Zhang, *J. Phys. Chem. C* **2010**, *114* (42), 18126–18133]