Electronic Supporting Information

For

Adsorption and separation of amyloid beta aggregates using ferromagnetic nanoparticles coated with charged polymer brushes

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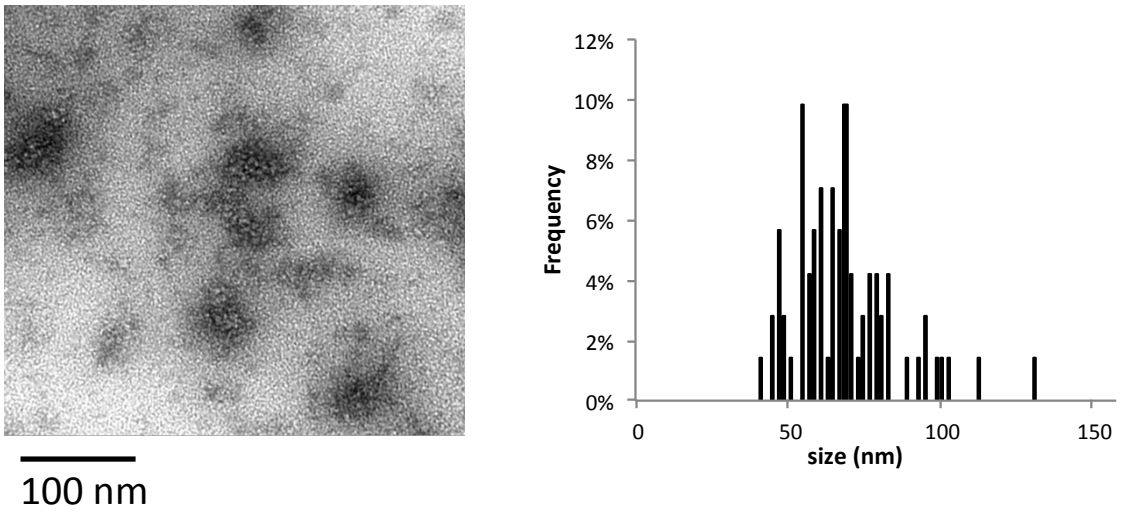

Figure S1 Size of oligomer determined by TEM. (a) TEM image of Aβ oligomer. The Aβ oligomer samples were dropped onto a carbon-coated TEM grid, and the grid was allowed to air-dry. Samarium acetate (2.5%) was used to stain the Aβ oligomer sample. Samples were observed at an excitation voltage of 80 kV using a JEM-1230 transmission electron microscope (JEOL, Tokyo, Japan). (b) The histogram demonstrates the size distribution of Aβ oligomers. Size of oligomers was determined by ImageJ software. The average size of oligomers is about 70 nm (67 ±17 nm).

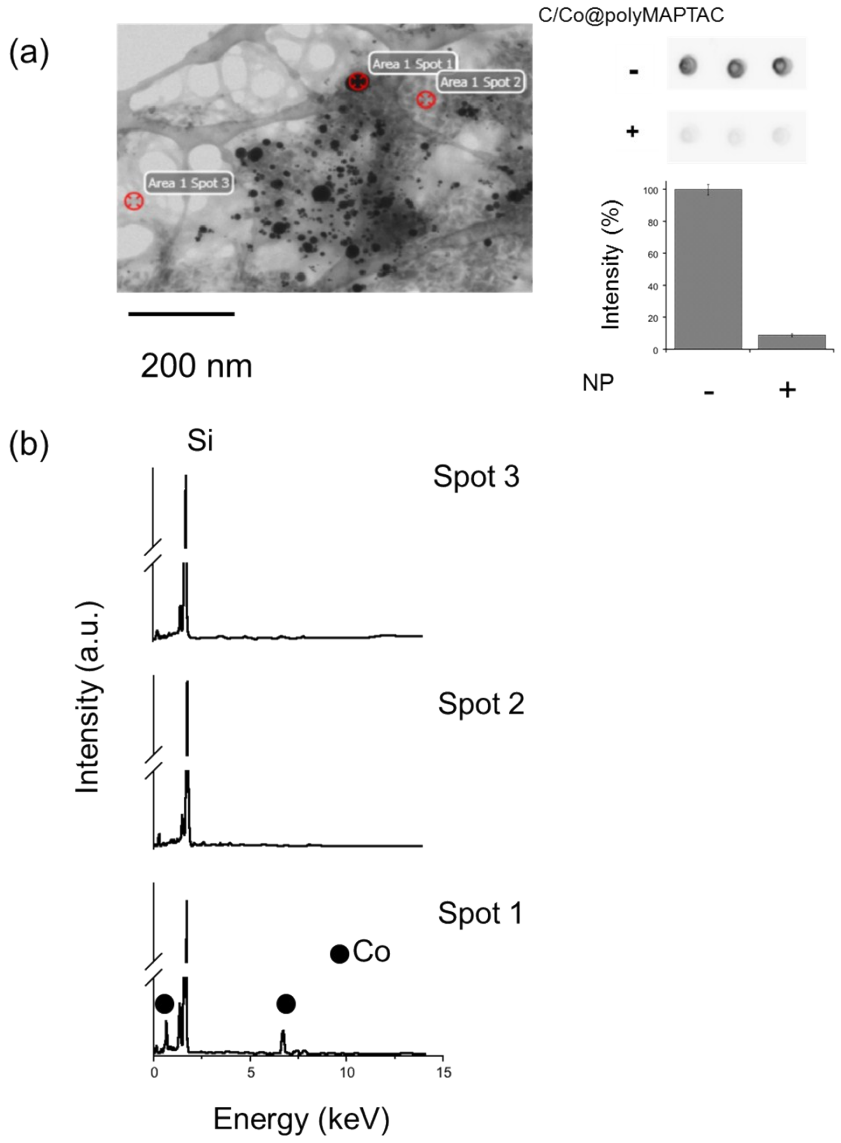

Figure S2 a) The interaction between $A\beta_{1\text{-}40}$ fibrils and C/Co@polyMAPTAC was confirmed by scanning transmission electron microscopy (STEM). $A\beta_{1\text{-}40}$ peptide (Bachem, Bubendorf, Switzerland) dissolved in DMSO (1 M) was diluted in PBS (25 µM) and incubated at 37°C for 20 hrs. STEM images of 12.5µM $A\beta_{1\text{-}40}$ fibrils and 50 µg/mL NP was taken with Nova NANOSEM 450 (left, FEI, Oregon, USA). The scale bar= 200 nm (Left). Red circles are areas used for energy dispersive X-ray spectroscopy (EDX) determination as described below. Results of dot blot assay (right, upper) and derived bar graphs (right, lower) for quantification of the adsorption of C/Co@polyMAPTAC to $A\beta_{1\text{-}40}$ fibrils, were also shown. b), The identification of cobalt in the STEM image was carried out via EDX. Three areas were chosen for the detection, where spot 1 represented NP area, spot 2 represented $A\beta_{1\text{-}40}$ fibrils area, and spot 3 was grid only area. The characteristic peak of cobalt in the EDX-spectra appeared only in spot 1, indicating that dark spots on the STEM image was C/Co@polyMAPTAC.

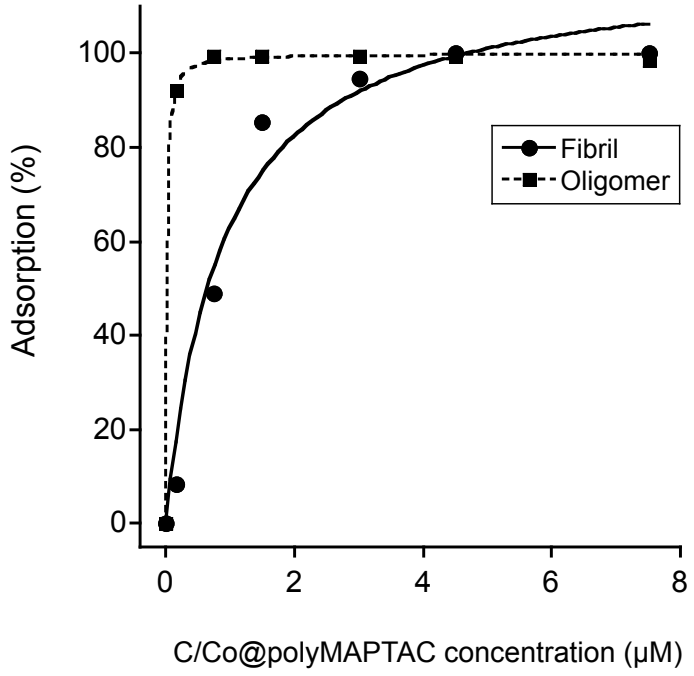

Figure S3 Affinity of C/Co@polyMAPTAC to Aβ fibrils and oligomers were estimated using the adsorption ratio (%) against various NP concentrations obtained from Fig.2b (fibrils) and Fig.3c (oligomers). The molar concentration of C/Co@polyMAPTAC was calculated assuming the nanoparticle mol/weight is 0.15 mmol/g, which was obtained by the element microanalysis (Zeltner, M. et al. *J. Mat. Chem.* (2012) 22, 12064-71).
The K_d (μM) values were fitted using the following equation;
Adsorption ratio(%)= A_0*[NP]/ (K_D+[NP])
Then K_d values for fibrils and oligomers were calculated to be 0.87 μM and 12 nM, respectively.

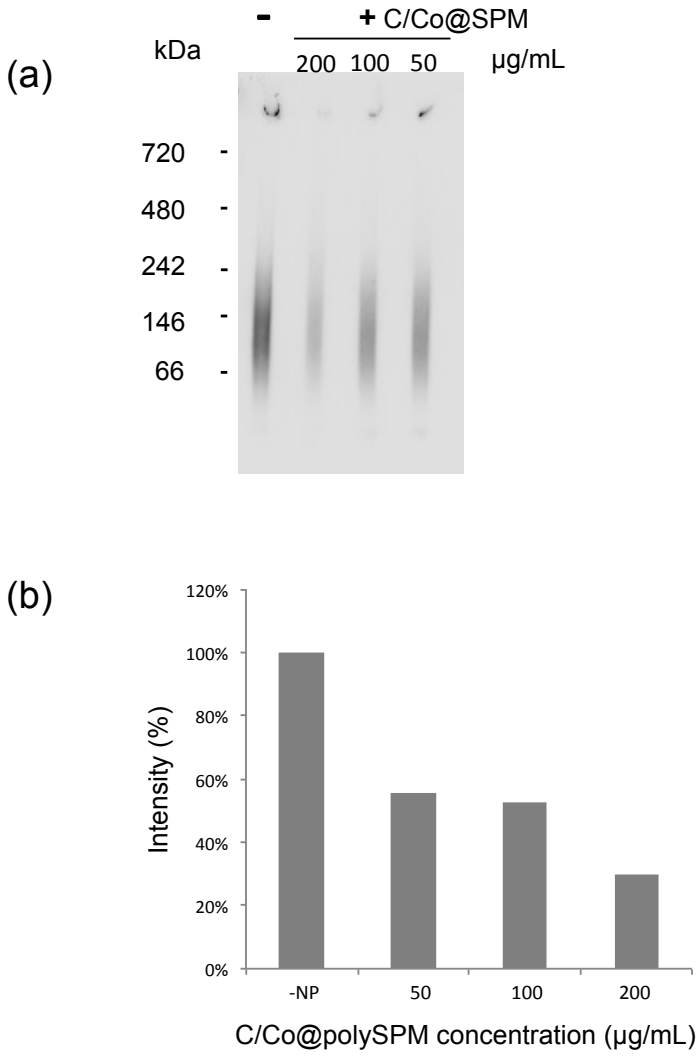

Figure S4 (a), The adsorption and separation of Aβ oligomers by C/Co@polySPM was confirmed by native PAGE/Western blot method. For the analysis, Aβ oligomer (12.5 μM) was incubated with C/Co@polySPM (0, 50, 100, 200 μg/mL) for 1 h. The supernatant after magnetic separation was subjected to the native PAGE/Western blot analysis. (b), The adsorption of oligomers onto NPs was quantified using the relative intensity of oligomers on the membrane. The intensities of the samples without C/Co@polySPM were normalized to 100%.