Electronic Supplementary Information (ESI) for Nanoscale

# Ultrafast Colorimetric Determination of Predominant Protein Structure Evolution with Gold Nanoplasmonic Particles

Hye Young Kim and Inhee Choi*

Department of Life Science, University of Seoul, 163 Siripdae-ro, Dongdaemun-gu, Seoul 130-743, Republic of Korea.

*Corresponding author: E-mail: inheechoi1@uos.ac.kr

Supporting Information

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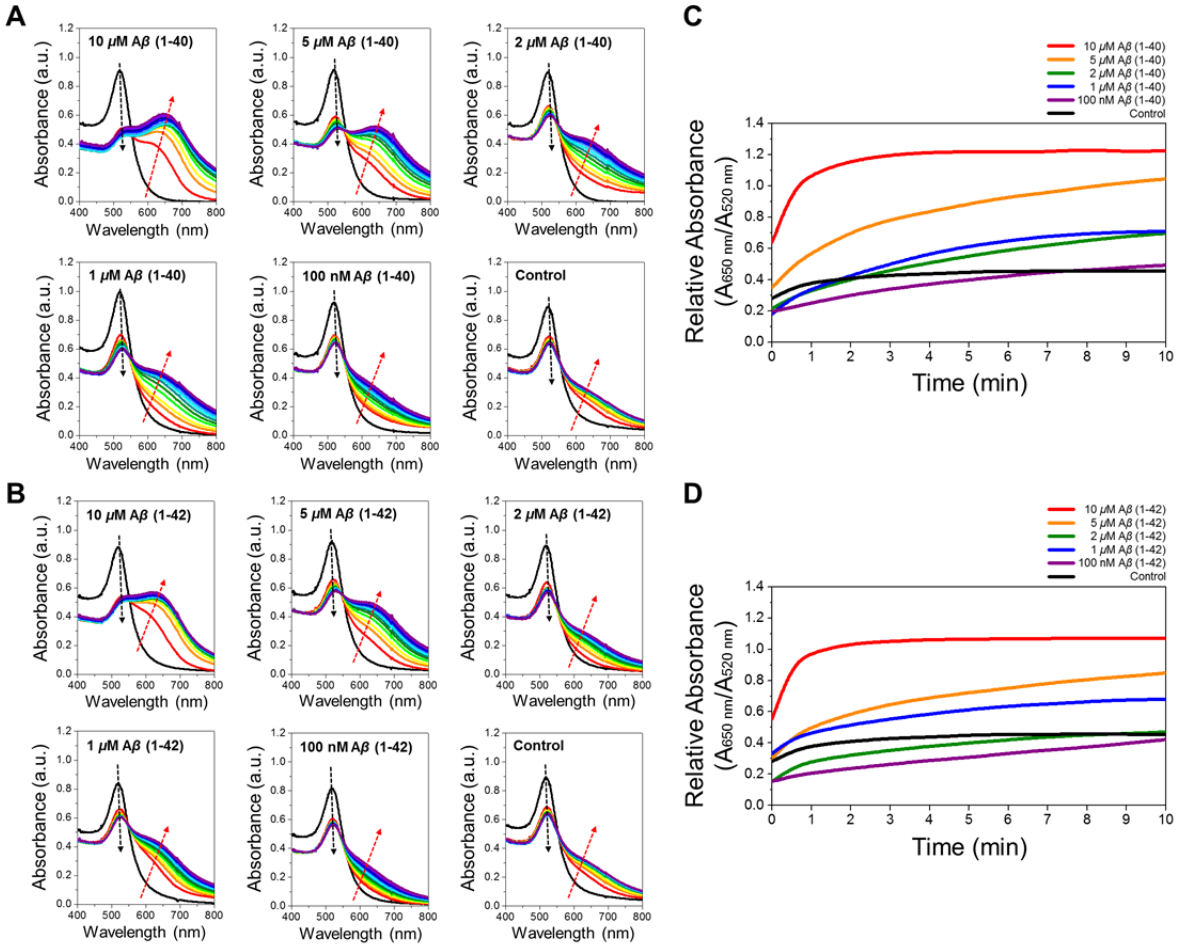


**Fig. S1.** Real-time monitoring and kinetic profiles of the A$\beta$ concentration- and type-dependent aggregation with ultraviolet-visible (UV-Vis) spectroscopy. (A) A$\beta$ (1-40) peptide. (B) A$\beta$ (1-42) peptide. Real-time spectral changes in the mixture solution of A$\beta$ peptides and gold nanoplasmonic particles (GNPs) were measured under acidic conditions. Various concentrations of the peptides were tested from 100 nM to 10 $\mu$M. The UV-Vis spectra were collected every min for 10 min. The arrows indicate the trends in the real-time spectral shift at the two plasmon bands of the intrinsic peak of GNPs (around 520 nm) and a newly formed larger aggregation indicator peak (around 650 nm). (C) A$\beta$ (1-40) peptide. (D) A$\beta$ (1-42) peptide. The concentration-dependent kinetic profiles for A$\beta$ aggregation that were described by the changes in relative absorbance ratios ($A_{650nm}/A_{520nm}$).

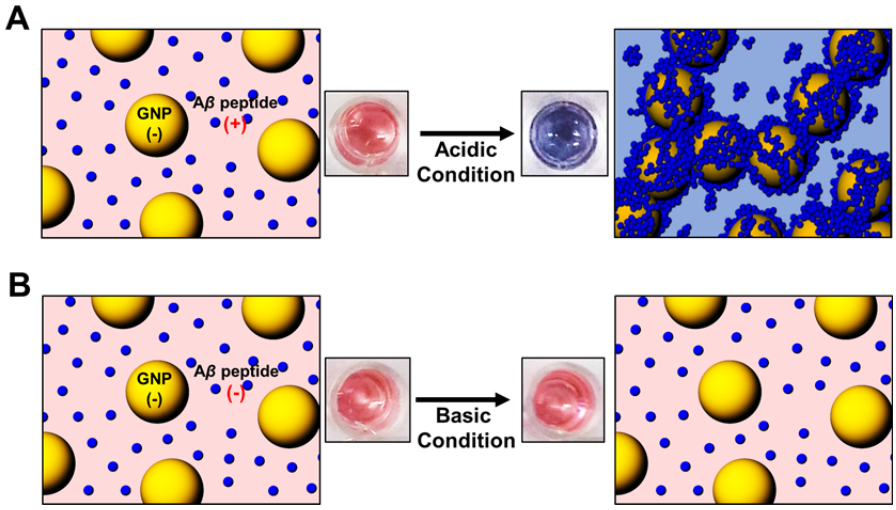


**Fig. S2.** The real observed color transition and its conceptual illustration for protein aggregation under different pH conditions. (A) Acidic conditions (pH 2~3). (B) Basic conditions (pH 11~12).

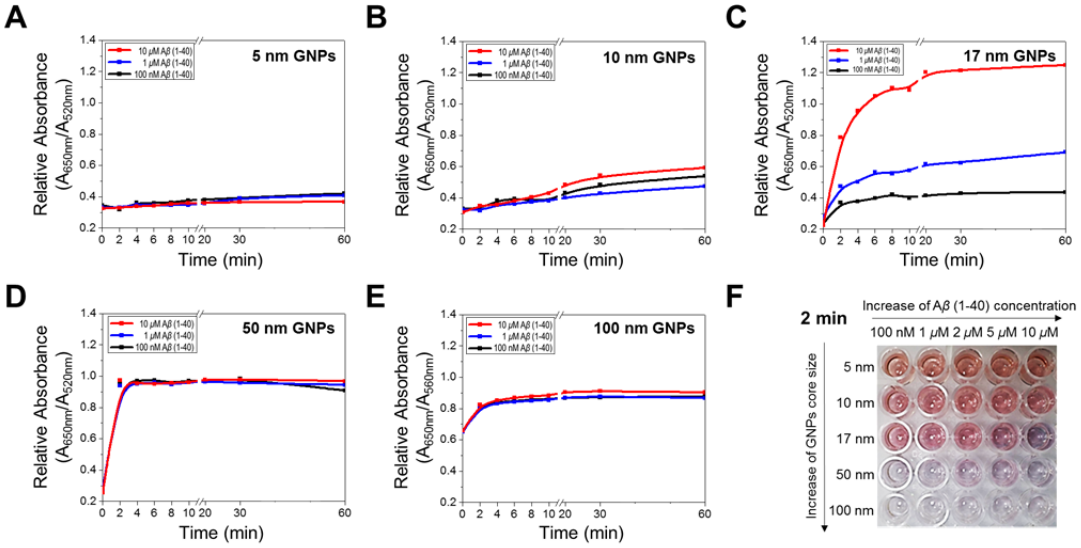


**Fig. S3.** Plots for colorimetric responses showing the different protein aggregation kinetics according to the size of nanoparticles. (A) 5-nm GNPs, (B) 10-nm GNPs, (C) 17-nm GNPs, (D) 50-nm GNPs, (E) 100-nm GNPs, and (F) Corresponding color changes observed after 2 minutes.

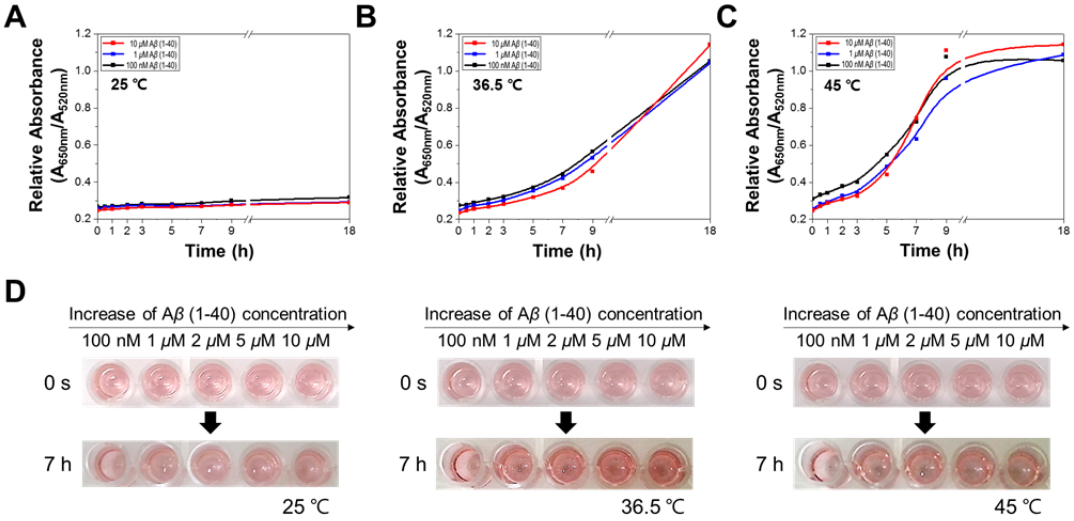


**Fig. S4.** Plots for colorimetric responses showing the different protein aggregation kinetics according to the incubation temperature. (A) 25 $^{o}$C, (B) 36.5 $^{o}$C, (C) 45 $^{o}$C, and (D) Corresponding color changes observed after 7 hours.

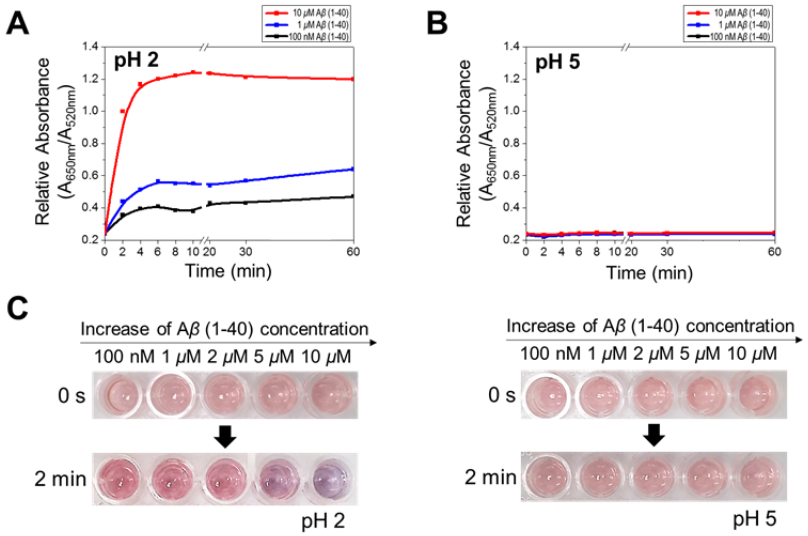


**Fig. S5.** Plots for colorimetric responses showing the different protein aggregation kinetics under different pH levels. (A) pH 2, (B) pH 5, and (C) Corresponding color changes observed after 2 minutes.