Electronic Supplementary Information (ESI)

Multifunctional Carbon Dots as a Therapeutic Nanoagent for Modulating Cu(II)-Mediated β-Amyloid Aggregation

You Jung Chung, Byung Il Lee, and Chan Beum Park*

Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon 34141, Republic of Korea

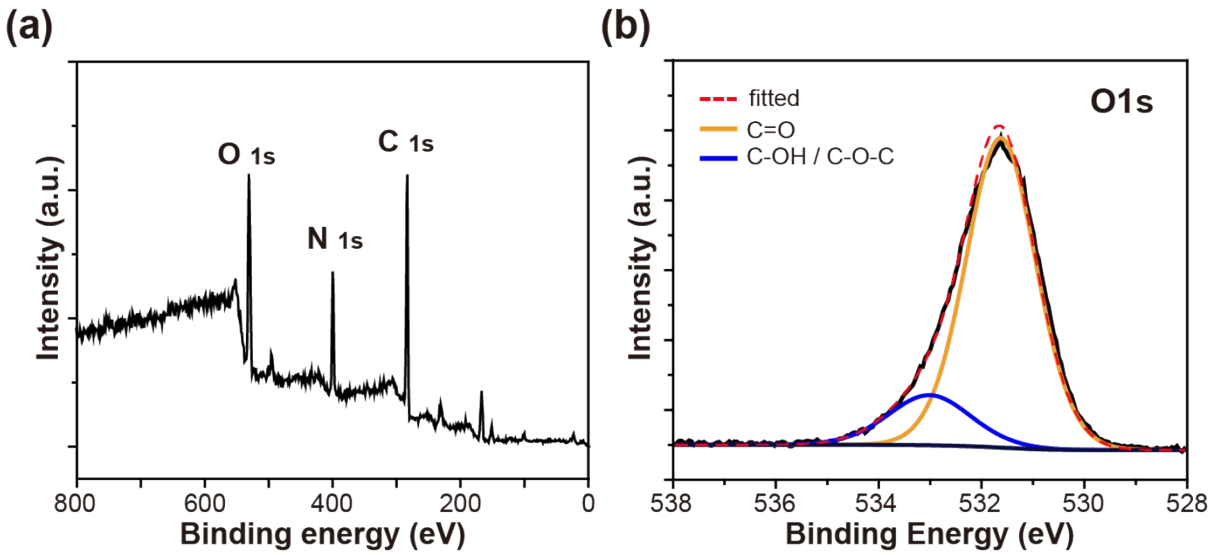

Figure S1. (a) XPS survey scan spectrum of OPCDs (C1s at 284.8 eV, N1s at 399 eV, and O1s at 532.2 eV), (b) Deconvoluted O1s XPS scan spectrum of OPCDs (C=O at 531.6 eV and C-OH/C-O-C at 533 eV).

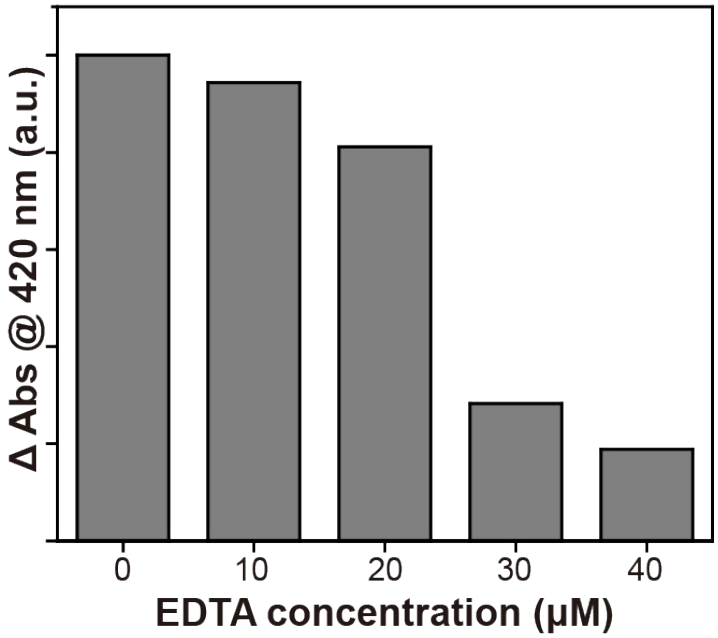

Figure S2. The absorption change of OPCDs in the presence of Cu(II) (40 μM) and various concentrations of EDTA (0, 10, 20, 30, and 40 μM). Upon the addition of EDTA, the enhancement of OPCDs absorption at 420 nm was suppressed in an EDTA dose-dependent manner. The changes in absorption value were measured after 30 minutes of incubation.

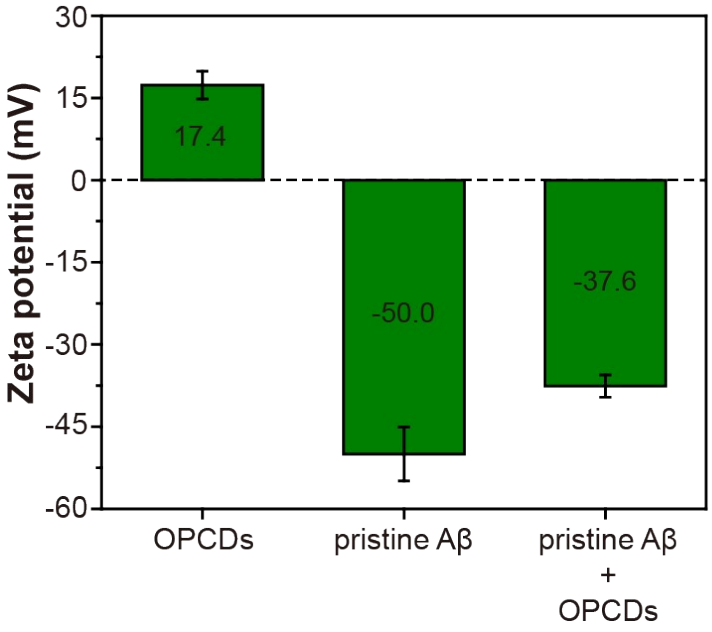

Figure S3. Zeta potential of OPCDs (100 μg/mL) and Aβ peptides (40 μM) that were incubated with or without OPCDs. The measurement was performed triplicate.

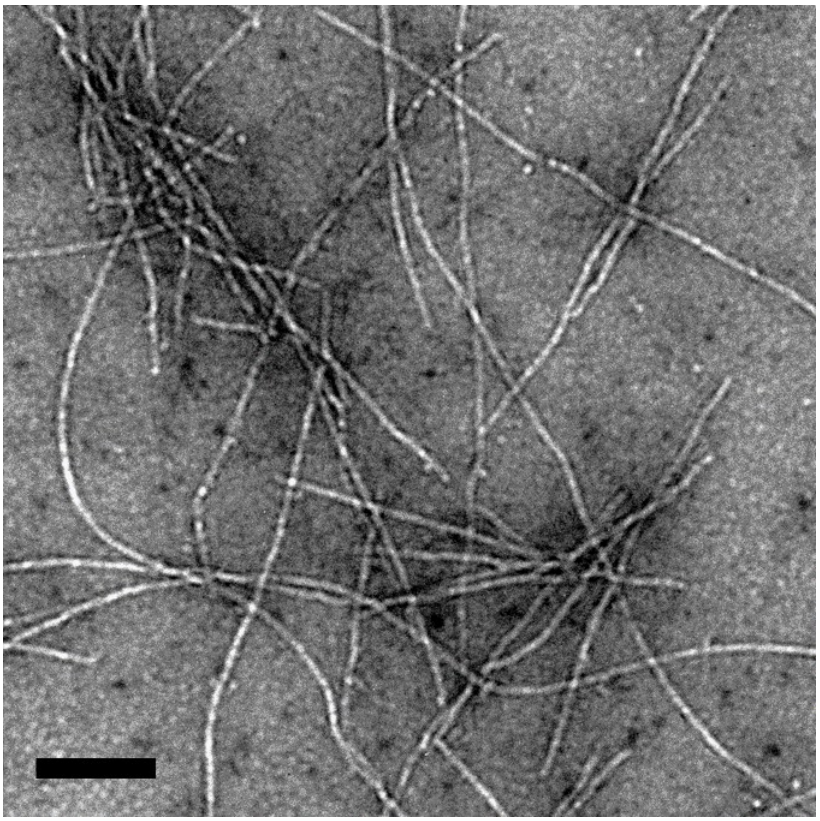

Figure S4. HRTEM images of metal-free Aβ aggregates. $A\beta_{42}$ monomers (40 μM) were incubated for 24 hours at 37°C before TEM observation. Scale bar: 200 nm.

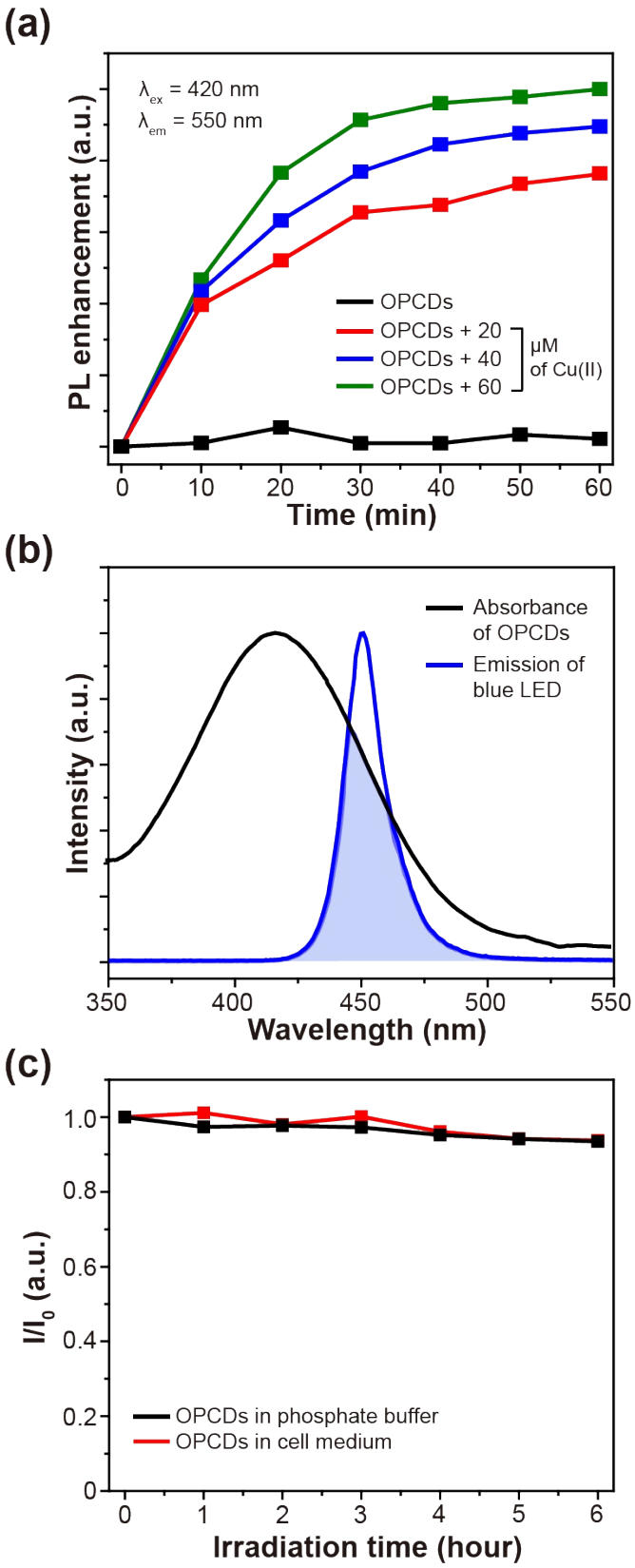

Figure S5. (a) The enhancement in OPCDs' PL intensity at 550 nm (λ_{ex}=420 nm) induced by time-dependent Cu(II) complexation. (b) The overlapping spectra between the absorbance of OPCDs and the emission of blue LED. (c) Photostability test of OPCDs under continuous blue LED light irradiation.

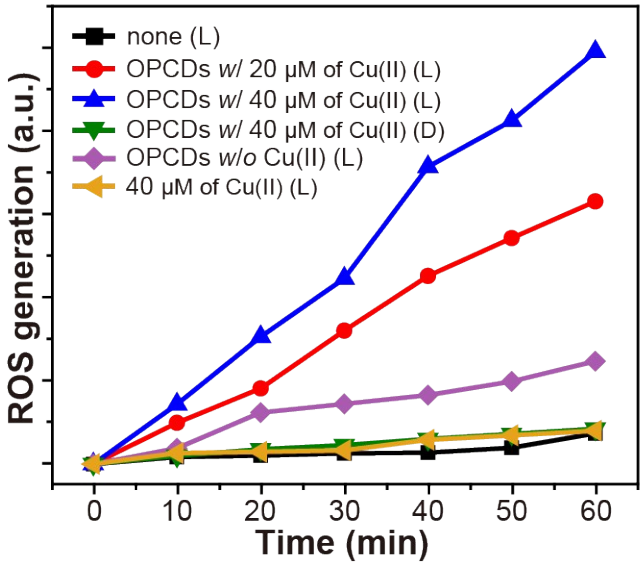

Figure S6. The normalized time profile of PL values of Rh123 under each condition (with or without OPCDs, Cu(II), L: light irradiating condition, or D: dark condition). In the presence of ROS (e.g., singlet oxygen), a ROS detector DHR123 is converted into Rh123 and starts to exhibit the emission at 525 nm (λ_{ex}=485 nm). The measurement was conducted every 10 minutes.

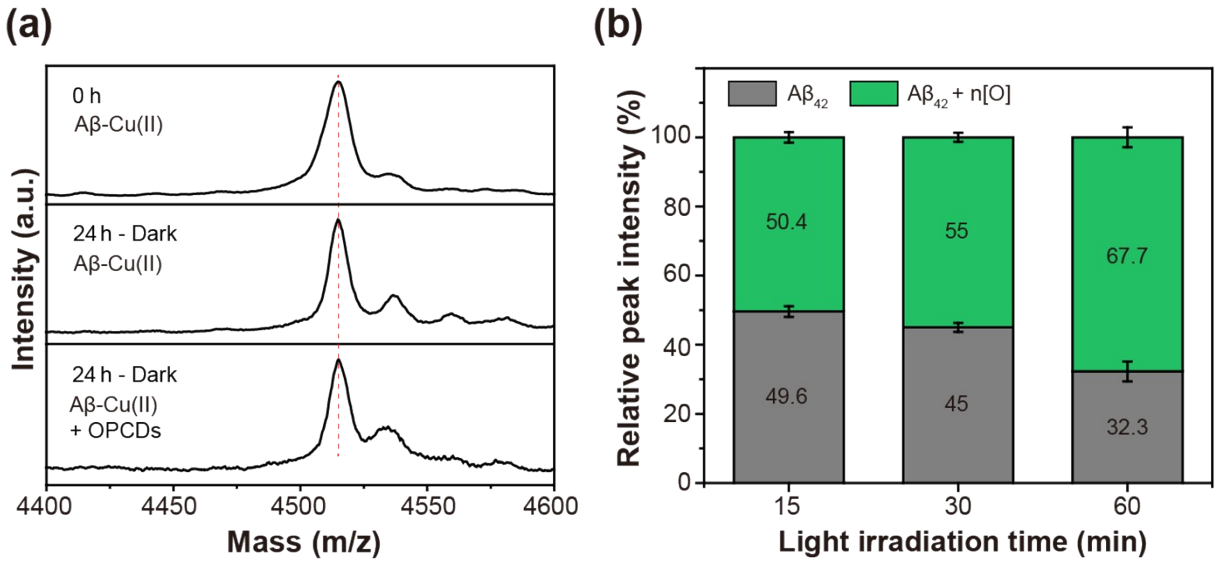

Figure S7. (a) The MALDI-TOF mass spectra of Aβ-Cu(II) complexes incubated with or without OPCDs under dark conditions, (b) Relative MALDI-TOF peak intensity of each Aβ-Cu(II) sample treated by OPCDs illuminated for different time (15, 30, and 60 minutes). All Aβ-Cu(II) samples were incubated for 24 hours at 37°C. The concentration of OPCDs was 50 μg/mL.