

Supplementary Information

A water-soluble carbon nanotube network conjugated by nanoparticles with defined nanometer gaps

Mime Kobayashi,[‡] Shinya Kumagai, Bin Zheng, Yukiharu Uraoka, Trevor Douglas
and Ichiro Yamashita

Graduate School of Materials Science, Nara Institute of Science and Technology

[‡]Present address: *Japanese Foundation for Cancer Research*

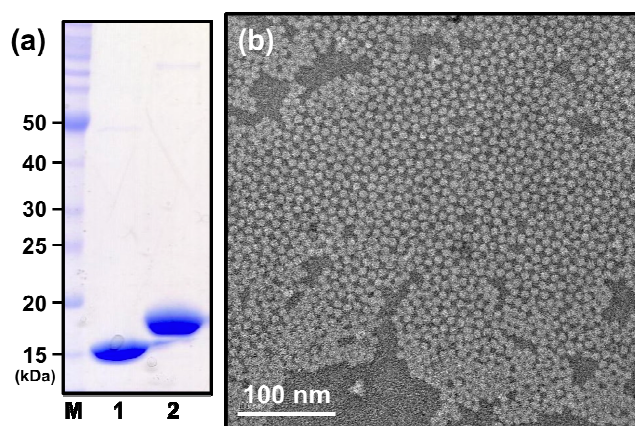


Fig. S1 Expression and purification of NHBP-LiDps protein. (a) Protein purity was confirmed by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) using a 12.5% gel (READY GELS J, Bio-Rad) followed by Coomassie Brilliant Blue staining. Lane M; size marker, lane 1; LiDps, lane 2; NHBP-LiDps. (b) A TEM image of NHBP-LiDps protein expressed in *E. coli* after purification. White circles of about 9 nm diameters are LiDps proteins, which were stained with 3% phosphotungstic acid (PTA). The proteins were apparently rhombohedrally aligned (upper region of the TEM image) although conventional hexagonal packaging was also observed (bottom region of the TEM image).

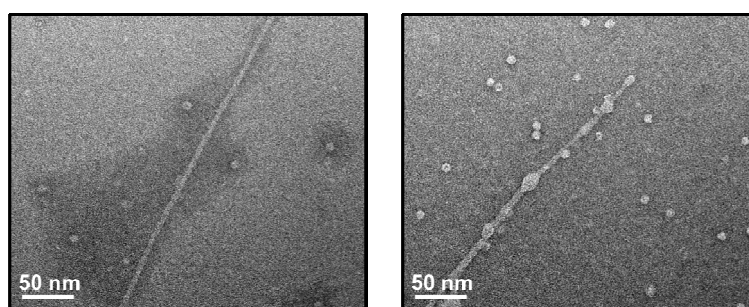


Fig. S2 Without the peptide displayed outside of LiDps proteins, cage-shaped proteins were observed to be indifferent to SWNTs. Two representative PTA-stained TEM images from a single sample preparation of LiDps protein mixed with single-walled carbon nanotubes (SWNTs) are shown for better assessment of the effect of NHBP-1 peptide.

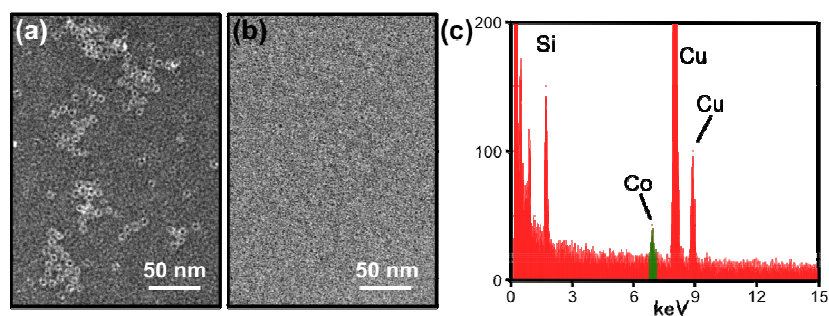


Fig. S3 Co nanoparticles are formed inside NHBP-LiDps proteins. TEM images of the protein with Co oxide core stained with (a) 3% PTA and (b) 1% aurothioglucose, which does not stain the central cavity of the cage-shaped protein. (c) EDS spectra of non-stained sample. Cu and Si signals were derived from a TEM grid.



Fig. S4 A high-resolution scanning electron microscopy (SEM) image of Co oxide nanoparticles aligned along SWNTs. To obtain the maximum resolution, SWNT-protein complex in pure H₂O was put onto a surface-cleaned silicon oxide substrate. Protein shell is not visible in SEM image.

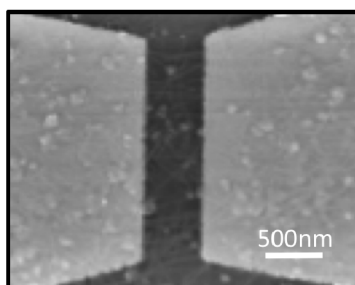


Fig. S5 An SEM image of the SWNT/NHBP-LiDps(Co) structures covering a pair of Au electrodes fabricated on a silicon surface. Co oxide nanoparticles were not visible because their size was under the limit of resolution when they are bridging 25 nm-high electrodes, and not on a flat surface (Fig. S4).