

# DNA Brush-Directed Vertical Alignment of Extensive Gold Nanorod Arrays with Controlled Density

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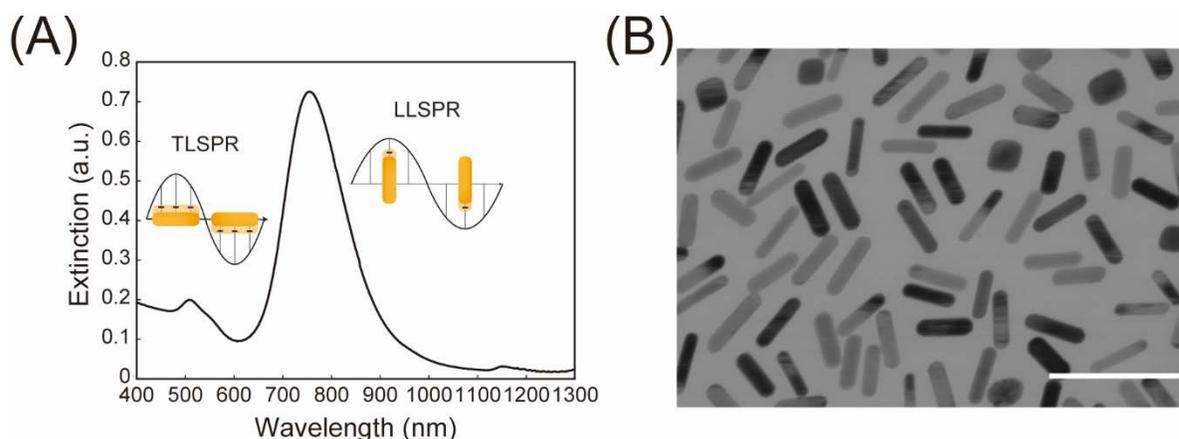
## MATERIALS

Oligonucleotides are purchased from Thermo Fisher Scientific, Inc. (USA). Oligonucleotide are according to the list below.

Name	Sequence
22 base Biotin-primer	5' biotin-GTACGAACGCCATCGACTTACG 3'
21 base Alexa647-primer	5' alexa647-GAGCCCGTCGAGAATACTGGC 3'

2-(carbomethoxy) ethyltrichlorosilane (CMETS) was purchased from Fluorochem, Ltd. (UK). Amine-PEG<sub>2</sub>-Biotin was purchased from Thermo Fisher Scientific, Inc. (USA). H<sub>2</sub>SO<sub>4</sub> and NaBH<sub>4</sub> were purchased from Sigma-Aldrich, Inc. (USA). Ultrapure water (18.2 MΩcm<sup>-1</sup>, Milli-Q, Millipore, USA) was used to make up all solutions. λ-DNA was purchased from Nippon Gene Co., Ltd. (Japan). 20-(11-Mercaptoundecanyloxy)-3, 6, 9, 12, 15, 18-hexaoxaicosane-1-amine, hydrochloride, 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide, hydrochloride (EDC) and 11-Mercaptoundecanol hexaethyleneglycol ether were purchased from Dojindo Molecular technologies, Ltd. (Japan). Epoxy resin (EPON812 RESIN), dodecyl succinic anhydride (DDSA), methyl nadic anhydride (MNA) and 2, 4, 6-Tris(dimethylaminomethyl)phenol (DMP-30) were purchased from TAAB Laboratories Equipment, Ltd. (UK). QIA quick PCR Purification Kit was purchased from Qiagen, Inc. (Germany). Quick Taq HS DyeMix was purchased from TOYOBO Co., Ltd. (Japan). All other salts and reagents, were purchased from Wako Pure Chemical Industries, Ltd. (Japan). Glass cuvettes were purchased from TOSOH Co., Ltd. (Japan). Scanning transmission electron microscopic (STEM) images were obtained using a STEM HD-2000 system (Hitachi High-Tech Manufacturing & Service Co., Ltd., Japan) with 200 kV acceleration voltage. Field emission scanning electron microscope (FE-SEM) images were obtained using a JSM-7800F (JASCO Corporation, Japan) with 200 kV acceleration voltage. Extinction spectra were measured

with a Lambda900s spectrophotometer (PerkinElmer, Inc., USA) and a V-650 UV-vis spectrometer (JASCO Corporation, Japan). The quantitative analysis of the amount of the



adsorbed GNRs was performed with an ICPE-9000 (Shimadzu Corporation, Japan).

Figure S1. Characterization of as prepared CTAB-coated GNRs. (A) Extinction spectrum of the GNRs. (B) STEM image of the GNRs. The peak for TLSPR is located around 510 nm. The peak for LLSPR is located around 760 nm. The size was calculated as the average of over 300 particles based on TEM images. The length was  $34 \pm 4.5$  nm. The width was  $10 \pm 1.6$  nm. Spherical and cuboid nanoparticles were obtained as byproducts. The yield of the byproducts was c.a. 10%. Scale bar corresponds to 80 nm.

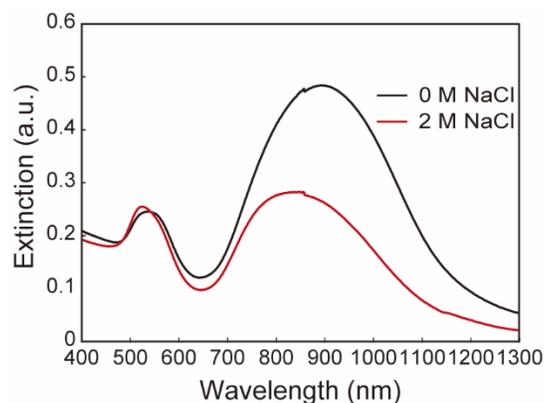
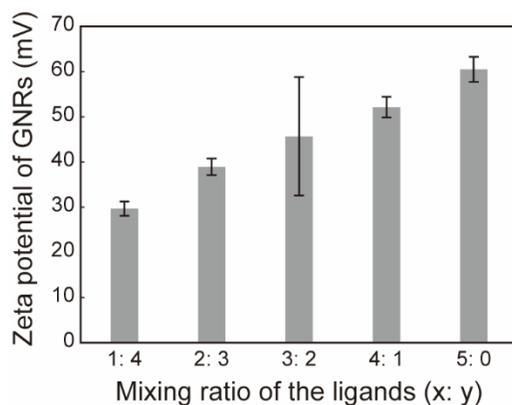


Figure S2. Extinction spectra of the adsorbed GNRs modified with the cationic ligand on the DNA brush ( $1200 \text{ chains}/\mu\text{m}^2$ ) in 10 mM Tris-HCl buffer (red line) and 10 mM Tris-HCl buffer



containing 2M NaCl (black line).

Figure S3. Zeta potential of GNRs covered with various ratios of the  $\text{NH}_2\text{EG6C}_{11}$  and  $\text{EG6C}_{11}$  ligands. Zeta potential measurement was carried out 3 times at a final concentration of about 5 nM.

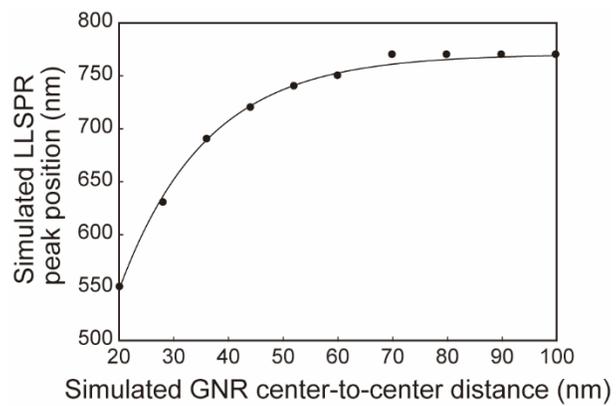


Figure S4. Simulated LLSPR peaks on the various center-to-center distances. Curve fitting was performed as an exponential curve ( $Y=770-a*\exp(b*(x-c))$ ).