Deterministic Assembly of Linear Gold Nanorod Chains as a Platform for Nanoscale Applications

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SUPPORTING INFORMATION FOR PUBLICATION

1. Size Distribution of the gold nanorods (Au NRs)

The distributions were estimated by examining SEM pictures of a dried droplet of Au NRs using an image recognition software (National Instruments Vision Assistant).

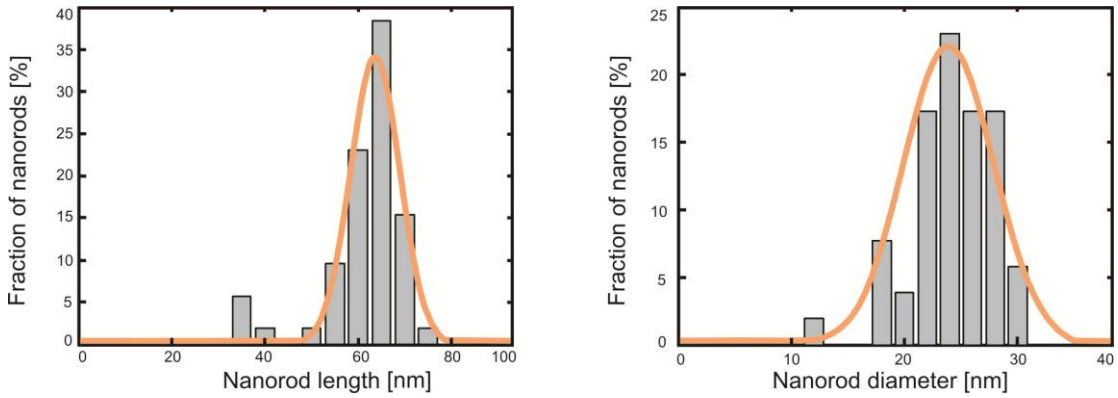

Figure SI 1. Size distribution of the Au NRs: by (a) length and (b) diameter.

2. Transfer of the Au NRs

For the 80±3 nm deep structures, the transfer of the Au NRs out of the channels required a thick PMMA layer on the target substrate. This process step turned out to be critical as plasma-induced heating of the sample may irreversibly affect alignment of the Au NRs and result in a slight offset from their axial alignment (Figure SI 2a). In addition, the plasma etching could also cause fusing of the Au NR particles (Figure SI 2 b). Optimal etching results were achieved for plasma powers lower than 200 W and short etching times. Typically, four etching cycles of 30 sec with intermediate control of the remaining PMMA layer thickness were performed sequentially and found to be sufficient to remove the PMMA without altering the structural properties of the Au NR chains. We could also show that even after removing the PMMA by oxygen plasma and acetone, the Au NRs kept their axially aligned position and did not experience any shifting.

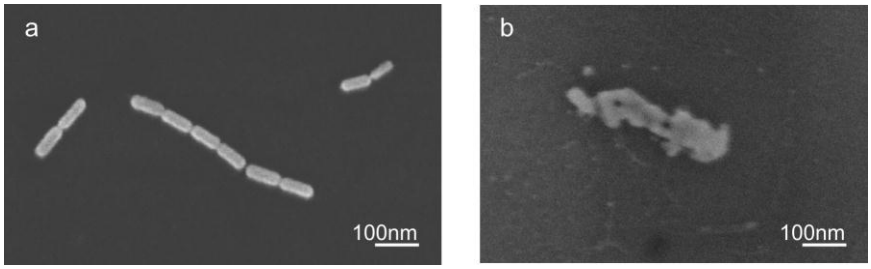

Figure SI 2. (a) Au NRs aligned into a line shifted during the removal of the underlying PMMA. (b) Au NRs fused due to the exposure to the O_2 plasma.

3. Chemical Structure of the OPV-5

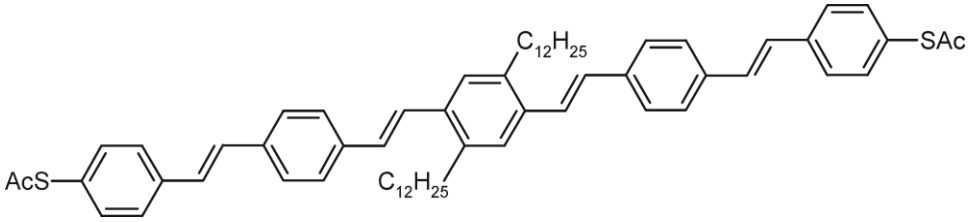

Figure SI 3. Chemical structure of the OPV-5 Ac molecule.

4. Measurements of the Au NR chains

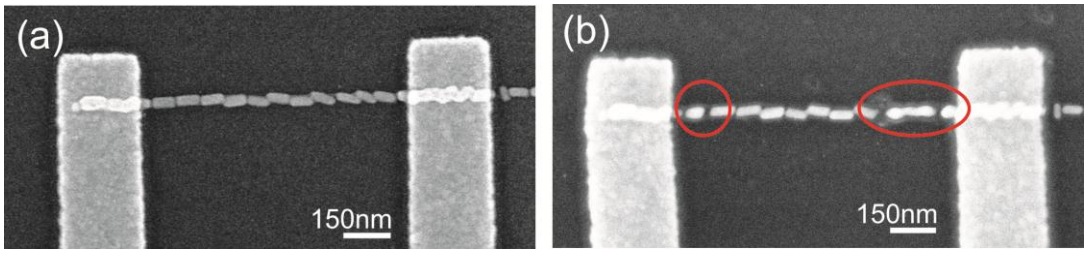

Figure SI 4. SEM picture of the topmost of the three Au NR chains in Figure 7a (a) prior to and (b) after electrical characterization. Some of the Au NRs within the chain apparently altered their shape after a voltage increase to 14 V, presumably as a consequence of Joule heating (red circles). In the middle chain and the lowermost chain no changes were visible, which indicates that most of the current passed through the topmost chain of Au NRs.

5. Parameters for HSQ application before EBL exposure

Structure height	HSQ	Spinning speed [rpm]	Spinning time [sec]
40±3 nm	Dow Corning XR-1514-002	2000	40
60±3 nm	Dow Corning XR-1514-006 diluted to 4 % in MIBK	6000	60
80±3 nm	Dow Corning XR-1514-006 diluted to 4 % in MIBK	4000	40

All structure heights were measured by AFM after EBL exposure, development and backing.