Electronic Supplementary Material (ESI) for ChemComm.

Supporting information

Tuning Structural Asymmetries of Three- Dimensional Gold Nanorod Assemblies

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Experimental Section

Materials. All the chemicals were commercially obtained. Tetrachloroauric acid ($HAuCl_4$) was purchased from Alfra, cetyltrimethyl ammonium bromide (CTAB), sodium dodecylsulfate (SDS), silver nitrate, sodium borohydride ascorbic acid and alicylic acid were supplied by Sigma. bis(psulfanatophenyl)phenyl-phosphine (BSPP) was bought from Strem Chemicals. Non-thiolated DNA sequences were bought from Invitrogen. Thiolated DNA sequences of HPLC grade were bought from Sangon Biotech.

Preparation and functionalization of AuNRs.

Synthesis of AuNRs: 10×36 nm AuNRs were synthesized following our published protocol.[1] 20×40 nm AuNRs were prepared by a modified seed-mediated growth method under the assistance of aromatic molecues, as previously reported.[2]

Functionalization of the AuNRs with thiolated DNA: 1 mL of 0.95 nM AuNRs was mixed with 10 μL of 500 μM thiolated DNA in 1×TBE buffer containing 0.01% SDS, and incubate the mixture at room temperature for several hours. 10 μL of 5 M NaCl was added into the reaction solution for 10 times in 20 h. The DNA functionalized AuNRs were purified through 2% agrose gel electrophoresis in 0.5×TBE running buffer.

Assembly of AuNRs on rectangular DNA Origami and purification.

Assembly of DNA Origami: DNA Origami was obtained by annealing the single stranded M13mp18 with capturing strands and staple strands at a ratio of 1:10:10 from 94 °C to room temperature over 12 h. To avoid DNA Origami stacking, all of the side staples were left out. In order to get rid of excess staple strands and capturing strands, the origami products were stained using SYBR-Green and purified by 1% agarose gel electrophoresis using 0.5×TAE-Mg^{2+} (Tris, 20 mM; Acetic acid, 10 mM; EDTA, 1 mM; and Magnesium acetate, 6.25 mM; pH 8.0) as running buffer. The gel band of the DNA Origami was cut out under UV light and recovered by electroelution with dialysis membrane (8000–14000 MWCO).

Immobilization of AuNRs on DNA Origami and purification: The purified DNA Origami was mixed with DNA-functionalized AuNRs at the molar ratio of [DNA Origami]:[AuNR1]:[AuNR2]:[AuNR3] of 1:5:5:5. AuNR dimers and trimers were assembled by hybridizing DNA-modified AuNRs with capturing strands; the configuration of the AuNR dimers and trimers varied with the locations of the capturing strands on DNA Origami. The mixture of AuNRs and DNA Origami was annealed from 40°C to room temperature over 12 h. The assemblies were subjected to 1% agarose gel electrophoresis for 30 minutes at 100 V. In daylight, the desired band was cut out and recovered by electroelution with dialysis membrane (8000–14000 MWCO).

Characterization.

The absorption spectra of the AuNRs and their assemblies were measured by using PE lambda-25 UV/Vis spectrometer. The CD spectra were collected on an Applied Photophysics Chirascan Plus Spectropolarimeter. The measurement was carried out at the wavelength range of 400–900nm at room temperature in a 1.0 cm length cell. All the AuNR assemblies were diluted to 200 μL in 0.5×TAE-Mg^{2+}. The scanning speed is 100 nm/min. The baseline was corrected using 0.5×TAE-Mg^{2+} buffer. A Tecnai G2 F20 S-Twin TEM (FEI, USA) was used for sample observation.

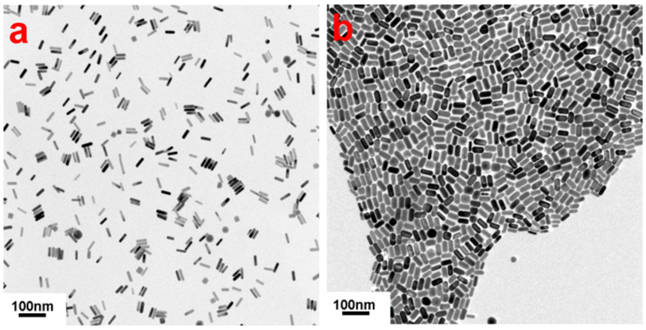

Fig S1. TEM images of (a) 10×36 nm AuNR and (b) 20×40 nm AuNR.

Table S1. Statistical sizes of 10×36 nm and 20×40 nm AuNR.

	Small AuNR	Big AuNR
Length (nm)	36.43±2.47	40.03±1.96
Width (nm)	9.88±1.37	19.97±2.02
Aspect ratio	3.69	2.00

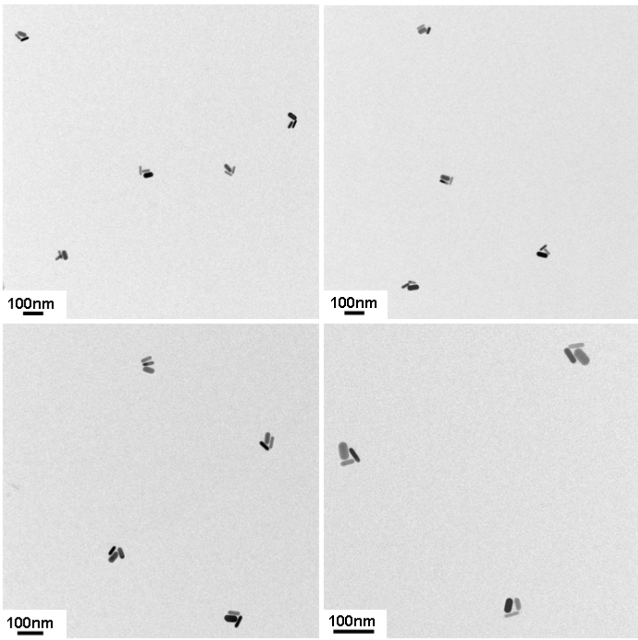

Fig S2. TEM images of trimer2.

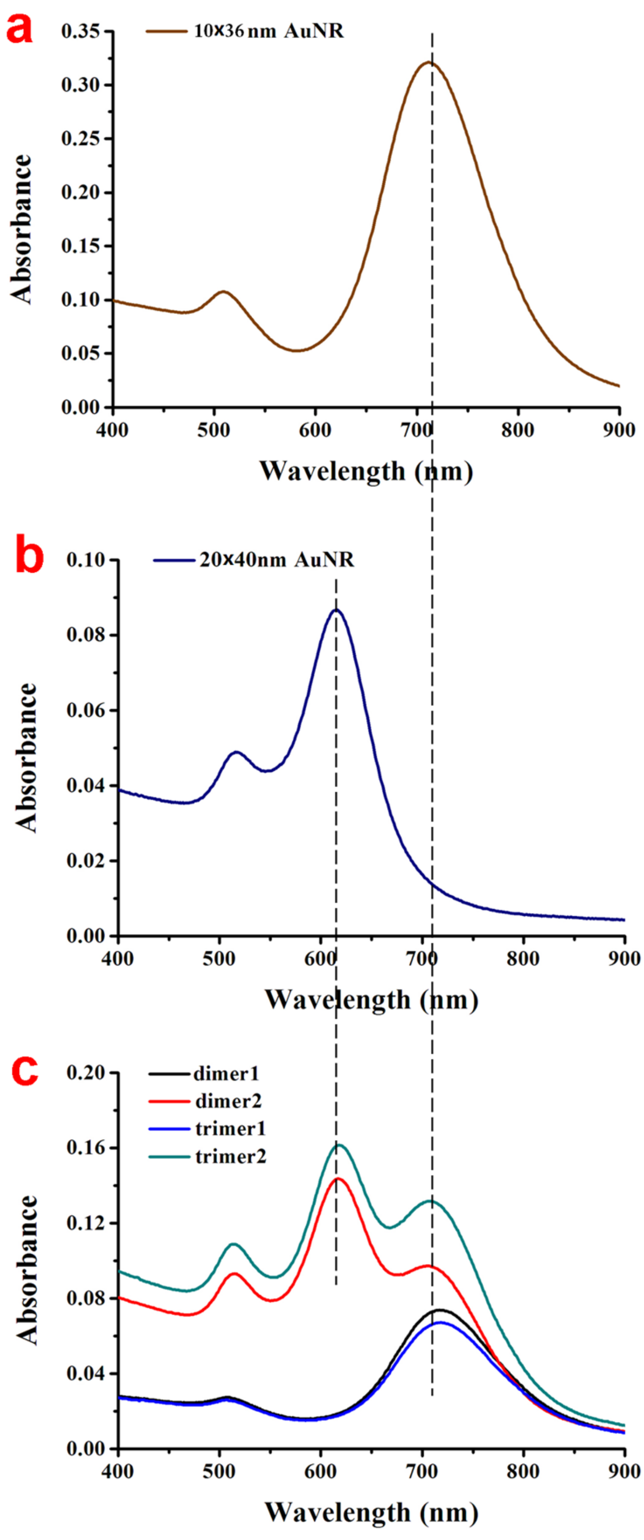

Fig S3. UV-vis absorption spectra of (a) 10×36 nm AuNR, (b) 20×40 nm AuNR and (c) assembled AuNR dimers and trimers.

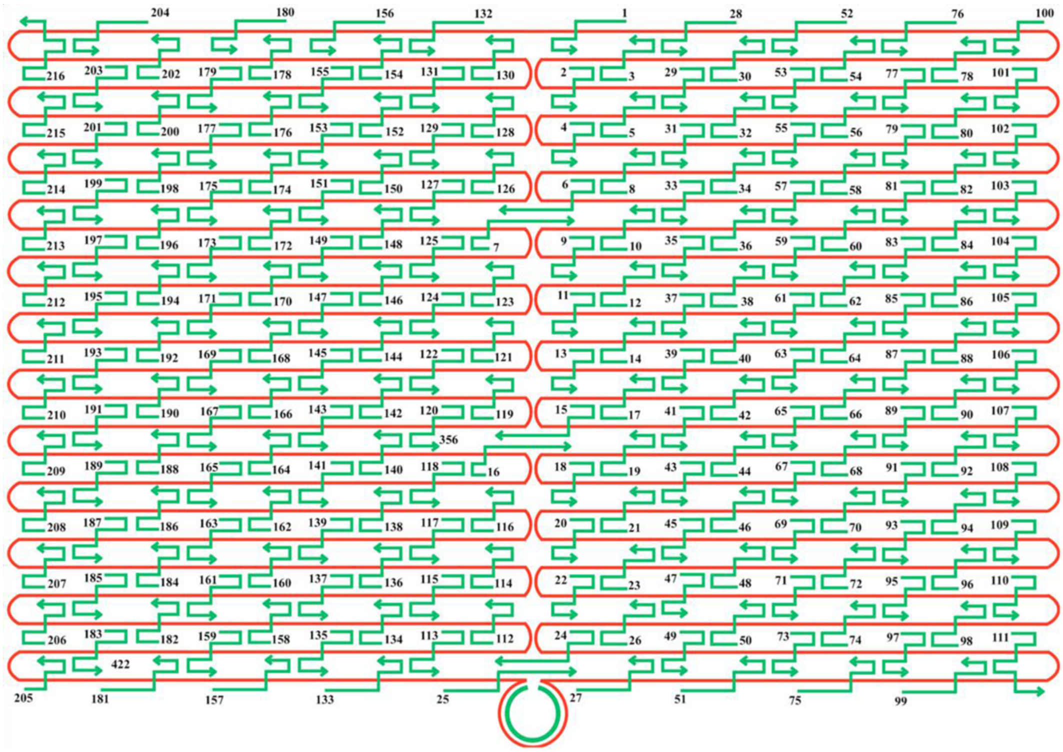

Figure S4. The basic rectangular DNA Origami used in present study without being modified with capturing strands on opposite sides**.** The green lines are short staple strands, the red line is single stranded M13mp18 viral DNA.

Sequence of staple strands used in the assembly of basic rectangular DNA origami (left to right 5'-3')

1 CAAGCCCAATAGGAAC CCATGTACAAACAGTT

2 AATGCCCCGTAACAGT GCCCGTATCTCCCTCA

3 TGCCTTGACTGCCTAT TTCGGAACAGGGATAG

4 GAGCCGCCCCACCACC GGAACCGCGACGGAAA

5 AACCAGAGACCCTCAG AACCGCCAGGGGTCAG

6 TTATTCATAGGGAAGG TAAATATT CATTCAGT

7 CATAACCCGAGGCATA GTAAGAGC TTTTTAAG

8 ATTGAGGGTAAAGGTG AATTATCAATCACCGG

9 AAAAGTAATATCTTAC CGAAGCCCTTCCAGAG

10 GCAATAGCGCAGATAG CCGAACAATTCAACCG

11 CCTAATTTACGCTAAC GAGCGTCTAATCAATA

12 TCTTACCAGCCAGTTA CAAAATAAATGAAATA

13 ATCGGCTGCGAGCATG TAGAAACCTATCATAT

14 CTAATTTATCTTTCCT TATCATTCATCCTGAA

15 GCGTTATAGAAAAAGC CTGTTTAG AAGGCCGG

16 GCTCATTTTCGCATTA AATTTTTG AGCTTAGA

17 AATTACTACAAATTCT TACCAGTAATCCCATC

18 TTAAGACGTTGAAAAC ATAGCGATAACAGTAC

19 TAGAATCCCTGAGAAG AGTCAATAGGAATCAT

20 CTTTTACACAGATGAA TATACAGTAAACAATT

21 TTTAACGTTCGGGAGA AACAATAATTTTCCCT

22 CGACAACTAAGTATTA GACTTTACAATACCGA

23 GGATTTAGCGTATTAA ATCCTTTGTTTTCAGG

24 ACGAACCAAAACATCG CCATTAAA TGGTGGTT

25 GAACGTGGCGAGAAAG GAAGGGAA CAAACTAT

26 TAGCCCTACCAGCAGA AGATAAAAACATTTGA

27 CGGCCTTGCTGGTAAT ATCCAGAACGAACTGA

28 CTCAGAGCCACCACCC TCATTTTCCTATTATT

29 CTGAAACAGGTAATAA GTTTTAACCCCTCAGA

30 AGTGTACTTGAAAGTA TTAAGAGGCCGCCACC

31 GCCACCACTCTTTTCA TAATCAAACCGTCACC

32 GTTTGCCACCTCAGAG CCGCCACCGATACAGG

33 GACTTGAGAGACAAAA GGGCGACAAGTTACCA

34 AGCGCCAACCATTTGG GAATTAGATTATTAGC

35 GAAGGAAAATAAGAGC AAGAAACAACAGCCAT

36 GCCCAATACCGAGGAA ACGCAATAGGTTTACC

37 ATTATTTAACCCAGCT ACAATTTTCAAGAACG

38 TATTTTGCTCCCAATC CAAATAAGTGAGTTAA

39 GGTATTAAGAACAAGA AAAATAATTAAAGCCA

40 TAAGTCCTACCAAGTA CCGCACTCTTAGTTGC

41 ACGCTCAAAATAAGAA TAAACACCGTGAATTT

42 AGGCGTTACAGTAGGG CTTAATTGACAATAGA

43 ATCAAAATCGTCGCTA TTAATTAACGGATTCG

44 CTGTAAATCATAGGTC TGAGAGACGATAAATA

45 CCTGATTGAAAGAAAT TGCGTAGACCCGAACG

46 ACAGAAATCTTTGAAT ACCAAGTTCCTTGCTT

47 TTATTAATGCCGTCAA TAGATAATCAGAGGTG

48 AGATTAGATTTAAAAG TTTGAGTACACGTAAA

49 AGGCGGTCATTAGTCT TTAATGCGCAATATTA

50 GAATGGCTAGTATTAA CACCGCCTCAACTAAT

51 CCGCCAGCCATTGCAA CAGGAAAAATATTTTT

52 CCCTCAGAACCGCCAC CCTCAGAACTGAGACT

53 CCTCAAGAATACATGG CTTTTGATAGAACCAC

54 TAAGCGTCGAAGGATT AGGATTAGTACCGCCA

55 CACCAGAGTTCGGTCA TAGCCCCCGCCAGCAA

56 TCGGCATTCCGCCGCC AGCATTGACGTTCCAG

57 AATCACCAAATAGAAA ATTCATATATAACGGA

58 TCACAATCGTAGCACC ATTACCATCGTTTTCA

59 ATACCCAAGATAACCC ACAAGAATAAACGATT

60 ATCAGAGAAAGAACTG GCATGATTTTATTTTG

61 TTTTGTTTAAGCCTTA AATCAAGAATCGAGAA

62 AGGTTTTGAACGTCAA AAATGAAAGCGCTAAT

63 CAAGCAAGACGCGCCT GTTTATCAAGAATCGC

64 AATGCAGACCGTTTTT ATTTTCATCTTGCGGG

65 CATATTTAGAAATACC GACCGTGTTACCTTTT

66 AATGGTTTACAACGCC AACATGTAGTTCAGCT

67 TAACCTCCATATGTGA GTGAATAAACAAAATC

68 AAATCAATGGCTTAGG TTGGGTTACTAAATTT

69 GCGCAGAGATATCAAA ATTATTTGACATTATC

70 AACCTACCGCGAATTA TTCATTTCCAGTACAT

71 ATTTTGCGTCTTTAGG AGCACTAAGCAACAGT

72 CTAAAATAGAACAAAG AAACCACCAGGGTTAG

73 GCCACGCTATACGTGG CACAGACAACGCTCAT

74 GCGTAAGAGAGAGCCA GCAGCAAAAAGGTTAT

75 GGAAATACCTACATTT TGACGCTCACCTGAAA

76 TATCACCGTACTCAGG AGGTTTAGCGGGGTTT

77 TGCTCAGTCAGTCTCT GAATTTACCAGGAGGT

78 GGAAAGCGACCAGGCG GATAAGTGAATAGGTG

79 TGAGGCAGGCGTCAGA CTGTAGCGTAGCAAGG

80 TGCCTTTAGTCAGACG ATTGGCCTGCCAGAAT

81 CCGGAAACACACCACG GAATAAGTAAGACTCC

82 ACGCAAAGGTCACCAA TGAAACCAATCAAGTT

83 TTATTACGGTCAGAGG GTAATTGAATAGCAGC

84 TGAACAAACAGTATGT TAGCAAACTAAAAGAA

85 CTTTACAGTTAGCGAA CCTCCCGACGTAGGAA

86 GAGGCGTTAGAGAATA ACATAAAAGAACACCC

87 TCATTACCCGACAATA AACAACATATTTAGGC

88 CCAGACGAGCGCCCAA TAGCAAGCAAGAACGC

89 AGAGGCATAATTTCAT CTTCTGACTATAACTA

90 TTTTAGTTTTTCGAGC CAGTAATAAATTCTGT

91 TATGTAAACCTTTTTT AATGGAAAAATTACCT

92 TTGAATTATGCTGATG CAAATCCACAAATATA

93 GAGCAAAAACTTCTGA ATAATGGAAGAAGGAG

94 TGGATTATGAAGATGA TGAAACAAAATTTCAT

95 CGGAATTATTGAAAGG AATTGAGGTGAAAAAT

96 ATCAACAGTCATCATA TTCCTGATTGATTGTT

97 CTAAAGCAAGATAGAA CCCTTCTGAATCGTCT

98 GCCAACAGTCACCTTG CTGAACCTGTTGGCAA

99 GAAATGGATTATTTAC ATTGGCAGACATTCTG

100 TTTT TATAAGTA TAGCCCGGCCGTCGAG

101 AGGGTTGA TTTT ATAAATCC TCATTAAATGATATTC

102 ACAAACAA TTTT AATCAGTA GCGACAGATCGATAGC

103 AGCACCGT TTTT TAAAGGTG GCAACATAGTAGAAAA

104 TACATACA TTTT GACGGGAG AATTAACTACAGGGAA

105 GCGCATTA TTTT GCTTATCC GGTATTCTAAATCAGA

106 TATAGAAG TTTT CGACAAAA GGTAAAGTAGAGAATA

107 TAAAGTAC TTTT CGCGAGAA AACTTTTTATCGCAAG

108 ACAAAGAA TTTT ATTAATTA CATTTAACACATCAAG

109 AAAACAAA TTTT TTCATCAA TATAATCCTATCAGAT

110 GATGGCAA TTTT AATCAATA TCTGGTCACAAATATC

111 AAACCCTC TTTT ACCAGTAA TAAAAGGGATTCACCA GTCACACG TTTT

112 CCGAAATCCGAAAATC CTGTTTGAAGCCGGAA

113 CCAGCAGGGGCAAAAT CCCTTATAAAGCCGGC

114 GCATAAAGTTCCACAC AACATACGAAGCGCCA

115 GCTCACAATGTAAAGC CTGGGGTGGGTTTGCC

116 TTCGCCATTGCCGGAA ACCAGGCATTAAATCA

117 GCTTCTGGTCAGGCTG CGCAACTGTGTTATCC

118 GTTAAAATTTTAACCA ATAGGAACCCGGCACC

119 AGACAGTCATTCAAAA GGGTGAGAAGCTATAT

120 AGGTAAAGAAATCACC ATCAATATAATATTTT

121 TTTCATTTGGTCAATA ACCTGTTTATATCGCG

122 TCGCAAATGGGGCGCG AGCTGAAATAATGTGT

123 TTTTAATTGCCCGAAA GACTTCAAAACACTAT

124 AAGAGGAACGAGCTTC AAAGCGAAGATACATT

125 GGAATTACTCGTTTAC CAGACGACAAAAGATT

126 GAATAAGGACGTAACA AAGCTGCTCTAAAACA

127 CCAAATCACTTGCCCT GACGAGAACGCCAAAA

128 CTCATCTTGAGGCAAA AGAATACAGTGAATTT

129 AAACGAAATGACCCCC AGCGATTATTCATTAC

130 CTTAAACATCAGCTTG CTTTCGAGCGTAACAC

131 TCGGTTTAGCTTGATA CCGATAGTCCAACCTA

132 TGAGTTTCGTCACCAG TACAAACTTAATTGTA

133 CCCCGATTTAGAGCTT GACGGGGAAATCAAAA

134 GAATAGCCGCAAGCGG TCCACGCTCCTAATGA

135 GAGTTGCACGAGATAG GGTTGAGTAAGGGAGC

136 GTGAGCTAGTTTCCTG TGTGAAATTTGGGAAG

137 TCATAGCTACTCACAT TAATTGCGCCCTGAGA

138 GGCGATCGCACTCCAG CCAGCTTTGCCATCAA

139 GAAGATCGGTGCGGGC CTCTTCGCAATCATGG

140 AAATAATTTTAAATTG TAAACGTTGATATTCA

141 GCAAATATCGCGTCTG GCCTTCCTGGCCTCAG

142 ACCGTTCTAAATGCAA TGCCTGAGAGGTGGCA

143 TATATTTTAGCTGATA AATTAATGTTGTATAA

144 TCAATTCTTTTAGTTT GACCATTACCAGACCG

145 CGAGTAGAACTAATAG TAGTAGCAAACCCTCA

146 GAAGCAAAAAAGCGGA TTGCATCAGATAAAAA

147 TCAGAAGCCTCCAACA GGTCAGGATCTGCGAA

148 CCAAAATATAATGCAG ATACATAAACACCAGA

149 CATTCAACGCGAGAGG CTTTTGCATATTATAG

150 ACGAGTAGTGACAAGA ACCGGATATACCAAGC

151 AGTAATCTTAAATTGG GCTTGAGAGAATACCA

152 GCGAAACATGCCACTA CGAAGGCATGCGCCGA

153 ATACGTAAAAGTACAA CGGAGATTTCATCAAG

154 CAATGACACTCCAAAA GGAGCCTTACAACGCC

155 AAAAAAGGACAACCAT CGCCCACGCGGGTAAA

156 TGTAGCATTCCACAGA CAGCCCTCATCTCCAA

157 GTAAAGCACTAAATCG GAACCCTAGTTGTTCC

158 AGTTTGGAGCCCTTCA CCGCCTGGTTGCGCTC

159 AGCTGATTACAAGAGT CCACTATTGAGGTGCC

160 ACTGCCCGCCGAGCTC GAATTCGTTATTACGC

161 CCCGGGTACTTTCCAG TCGGGAAACGGGCAAC

162 CAGCTGGCGGACGACG ACAGTATCGTAGCCAG

163 GTTTGAGGGAAAGGGG GATGTGCTAGAGGATC

164 CTTTCATCCCCAAAAA CAGGAAGACCGGAGAG

165 AGAAAAGCAACATTAA ATGTGAGCATCTGCCA

166 GGTAGCTAGGATAAAA ATTTTTAGTTAACATC

167 CAACGCAATTTTTGAG AGATCTACTGATAATC

168 CAATAAATACAGTTGA TTCCCAATTTAGAGAG

169 TCCATATACATACAGG CAAGGCAACTTTATTT

170 TACCTTTAAGGTCTTT ACCCTGACAAAGAAGT

171 CAAAAATCATTGCTCC TTTTGATAAGTTTCAT

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173 AAAGATTCAGGGGGTA ATAGTAAACCATAAAT

174 TTTCAACTATAGGCTG GCTGACCTTGTATCAT

175 CCAGGCGCTTAATCAT TGTGAATTACAGGTAG

176 CGCCTGATGGAAGTTT CCATTAAACATAACCG

177 TTTCATGAAAATTGTG TCGAAATCTGTACAGA

178 ATATATTCTTTTTTCA CGTTGAAAATAGTTAG

179 AATAATAAGGTCGCTG AGGCTTGCAAAGACTT

180 CGTAACGATCTAAAGT TTTGTCGTGAATTGCG

181 ACCCAAATCAAGTTTT TTGGGGTCAAAGAACG

182 TGGACTCCCTTTTCAC CAGTGAGACCTGTCGT

183 TGGTTTTTAACGTCAA AGGGCGAAGAACCATC

184 GCCAGCTGCCTGCAGG TCGACTCTGCAAGGCG

185 CTTGCATGCATTAATG AATCGGCCCGCCAGGG

186 ATTAAGTTCGCATCGT AACCGTGCGAGTAACA

187 TAGATGGGGGGTAACG CCAGGGTTGTGCCAAG

188 ACCCGTCGTCATATGT ACCCCGGTAAAGGCTA

189 CATGTCAAGATTCTCC GTGGGAACCGTTGGTG

190 TCAGGTCACTTTTGCG GGAGAAGCAGAATTAG

191 CTGTAATATTGCCTGA GAGTCTGGAAAACTAG

192 CAAAATTAAAGTACGG TGTCTGGAAGAGGTCA

193 TGCAACTAAGCAATAA AGCCTCAGTTATGACC

194 TTTTTGCGCAGAAAAC GAGAATGAATGTTTAG

195 AAACAGTTGATGGCTT AGAGCTTATTTAAATA

196 ACTGGATAACGGAACA ACATTATTACCTTATG

197 ACGAACTAGCGTCCAA TACTGCGGAATGCTTT

198 CGATTTTAGAGGACAG ATGAACGGCGCGACCT

199 CTTTGAAAAGAACTGG CTCATTATTTAATAAA

200 GCTCCATGAGAGGCTT TGAGGACTAGGGAGTT

201 ACGGCTACTTACTTAG CCGGAACGCTGACCAA

202 AAAGGCCGAAAGGAAC AACTAAAGCTTTCCAG

203 GAGAATAGCTTTTGCG GGATCGTCGGGTAGCA

204 ACGTTAGTAAATGAAT TTTCTGTAAGCGGAGT

205 TTTT CGATGGCC CACTACGTAAACCGTC

206 TATCAGGG TTTT CGGTTTGC GTATTGGGAACGCGCG

207 GGGAGAGG TTTT TGTAAAAC GACGGCCATTCCCAGT

208 CACGACGT TTTT GTAATGGG ATAGGTCAAAACGGCG

209 GATTGACC TTTT GATGAACG GTAATCGTAGCAAACA

210 AGAGAATC TTTT GGTTGTAC CAAAAACAAGCATAAA

211 GCTAAATC TTTT CTGTAGCT CAACATGTATTGCTGA

212 ATATAATG TTTT CATTGAAT CCCCCTCAAATCGTCA

213 TAAATATT TTTT GGAAGAAA AATCTACGACCAGTCA

214 GGACGTTG TTTT TCATAAGG GAACCGAAAGGCGCAG

215 ACGGTCAA TTTT GACAGCAT CGGAACGAACCCTCAG

216 CAGCGAAAA TTTT ACTTTCA ACAGTTT CTGGGA TTTTGCT AAACTTTT

Loop1 AACATCACTTGCCTGAGTAGAAGAACT

Loop2 TGTAGCAATACTTCTTTGATTAGTAAT

Loop3 AGTCTGTCCATCACGCAAATTAACCGT

Loop4 ATAATCAGTGAGGCCACCGAGTAAAAG

Loop5 ACGCCAGAATCCTGAGAAGTGTTTTT

Loop6 TTAAAGGGATTTTAGACAGGAACGGT

Loop7 AGAGCGGGAGCTAAACAGGAGGCCGA

Loop8 TATAACGTGCTTTCCTCGTTAGAATC

Loop9 GTACTATGGTTGCTTTGACGAGCACG

Loop10 GCGCTTAATGCGCCGCTACAGGGCGC

For AuNR dimer1

136 AAAAAAAAAAAAAAA AATGA GTGAGCTAGTTTCCTG TGTGAAATTTGGGAAG

134 GAATAGCCGCAAGCGG TCCACGCTCCT

117 AAAAAAAAAAAAAAA GCACC GCTTCTGGTCAGGCTG CGCAACTGTGTTATCC

118 GTTAAAATTTTAACCA ATAGGAACCCG

114 AAAAAAAAAAAAAAA CGGAA GCATAAAGTTCCACAC AACATACGAAGCGCCA

112 CCGAAATCCGAAAATC CTGTTTGAAGC

20 AAAAAAAAAAAAAAA AGTAC CTTTTACACAGATGAA TATACAGTAAACAATT

18 TTAAGACGTTGAAAAC ATAGCGATAAC

23 AAAAAAAAAAAAAAA TTTGA GGATTTAGCGTATTAA ATCCTTTGTTTTCAGG

26 TAGCCCTACCAGCAGA AGATAAAAACA

45 AAAAAAAAAAAAAAA ATTCG CCTGATTGAAAGAAAT TGCGTAGACCCGAACG

43 ATCAAAATCGTCGCTA TTAATTAACGG

71 AAAAAAAAAAAAAAA TTATC ATTTTGCGTCTTTAGG AGCACTAAGCAACAGT

69 GCGCAGAGATATCAAA ATTATTTGACA

176 ATA AGC TAT CGA ATC CGCCTGATGGAAGTTT CCATTAAACATAACCG

168 ATA AGC TAT CGA ATC CAATAAATACAGTTGA TTCCCAATTTAGAGAG

164 ATA AGC TAT CGA ATC CTTTCATCCCCAAAAA CAGGAAGACCGGAGAG

155 ATA AGC TAT CGA ATC AAAAAAGGACAACCAT CGCCCACGCGGGTAAA

151 ATA AGC TAT CGA ATC AGTAATCTTAAATTGG GCTTGAGAGAATACCA

147 ATA AGC TAT CGA ATC TCAGAAGCCTCCAACA GGTCAGGATCTGCGAA

143 ATA AGC TAT CGA ATC TATATTTTAGCTGATA AATTAATGTTGTATAA

For AuNR dimer2

136 AAAAAAAAAAAAAAA AATGA GTGAGCTAGTTTCCTG TGTGAAATTTGGGAAG

134 GAATAGCCGCAAGCGG TCCACGCTCCT

117 AAAAAAAAAAAAAAA GCACC GCTTCTGGTCAGGCTG CGCAACTGTGTTATCC

118 GTTAAAATTTTAACCA ATAGGAACCCG

114 AAAAAAAAAAAAAAA CGGAA GCATAAAGTTCCACAC AACATACGAAGCGCCA

112 CCGAAATCCGAAAATC CTGTTTGAAGC

20 AAAAAAAAAAAAAAA AGTAC CTTTTACACAGATGAA TATACAGTAAACAATT

18 TTAAGACGTTGAAAAC ATAGCGATAAC

23 AAAAAAAAAAAAAAA TTTGA GGATTTAGCGTATTAA ATCCTTTGTTTTCAGG

26 TAGCCCTACCAGCAGA AGATAAAAACA

45 AAAAAAAAAAAAAAA ATTCG CCTGATTGAAAGAAAT TGCGTAGACCCGAACG

43 ATCAAAATCGTCGCTA TTAATTAACGG

71 AAAAAAAAAAAAAAA TTATC ATTTTGCGTCTTTAGG AGCACTAAGCAACAGT

69 GCGCAGAGATATCAAA ATTATTTGACA

53 TCGGCCTAGTACACA CCTCAAGAATACATGG CTTTTGATAGAACCAC

57 TCGGCCTAGTACACA AATCACCAAATAGAAA ATTCATATATAACGGA

61 TCGGCCTAGTACACA TTTTGTTTAAGCCTTA AATCAAGAATCGAGAA

65 TCGGCCTAGTACACA CATATTTAGAAATACC GACCGTGTTACCTTTT

58 TCGGCCTAGTACACA TCACAATCGTAGCACC ATTACCATCGTTTTCA

62 TCGGCCTAGTACACA AGGTTTTGAACGTCAA AAATGAAAGCGCTAAT

66 TCGGCCTAGTACACA AATGGTTTACAACGCC AACATGTAGTTCAGCT

For AuNR trimer1 and trimer2

136 AAAAAAAAAAAAAAA AATGA GTGAGCTAGTTTCCTG TGTGAAATTTGGGAAG

134 GAATAGCCGCAAGCGG TCCACGCTCCT

117 AAAAAAAAAAAAAAA GCACC GCTTCTGGTCAGGCTG CGCAACTGTGTTATCC

118 GTTAAAATTTTAACCA ATAGGAACCCG

114 AAAAAAAAAAAAAAA CGGAA GCATAAAGTTCCACAC AACATACGAAGCGCCA

112 CCGAAATCCGAAAATC CTGTTTGAAGC

20 AAAAAAAAAAAAAAA AGTAC CTTTTACACAGATGAA TATACAGTAAACAATT

18 TTAAGACGTTGAAAAC ATAGCGATAAC

23 AAAAAAAAAAAAAAA TTTGA GGATTTAGCGTATTAA ATCCTTTGTTTTCAGG

26 TAGCCCTACCAGCAGA AGATAAAAACA

45 AAAAAAAAAAAAAAA ATTCG CCTGATTGAAAGAAAT TGCGTAGACCCGAACG

43 ATCAAAATCGTCGCTA TTAATTAACGG

71 AAAAAAAAAAAAAAA TTATC ATTTTGCGTCTTTAGG AGCACTAAGCAACAGT

69 GCGCAGAGATATCAAA ATTATTTGACA

176 ATA AGC TAT CGA ATC CGCCTGATGGAAGTTT CCATTAAACATAACCG

168 ATA AGC TAT CGA ATC CAATAAATACAGTTGA TTCCCAATTTAGAGAG

164 ATA AGC TAT CGA ATC CTTTCATCCCCAAAAA CAGGAAGACCGGAGAG

155 ATA AGC TAT CGA ATC AAAAAAGGACAACCAT CGCCCACGCGGGTAAA

151 ATA AGC TAT CGA ATC AGTAATCTTAAATTGG GCTTGAGAGAATACCA

147 ATA AGC TAT CGA ATC TCAGAAGCCTCCAACA GGTCAGGATCTGCGAA

143 ATA AGC TAT CGA ATC TATATTTTAGCTGATA AATTAATGTTGTATAA

53 TCGGCCTAGTACACA CCTCAAGAATACATGG CTTTTGATAGAACCAC

57 TCGGCCTAGTACACA AATCACCAAATAGAAA ATTCATATATAACGGA

61 TCGGCCTAGTACACA TTTTGTTTAAGCCTTA AATCAAGAATCGAGAA

65 TCGGCCTAGTACACA CATATTTAGAAATACC GACCGTGTTACCTTTT

58 TCGGCCTAGTACACA TCACAATCGTAGCACC ATTACCATCGTTTTCA

62 TCGGCCTAGTACACA AGGTTTTGAACGTCAA AAATGAAAGCGCTAAT

66 TCGGCCTAGTACACA AATGGTTTACAACGCC AACATGTAGTTCAGCT

The sequences of thiolated sticky ends used for modification of AuNRs localized respectively on opposites sides of DNA origami (left to right 5'-3')

ssDNA1: TTTTTTTTTTTTTTT AGCGA-SH

ssDNA2: GATTCGATAGCTTAT GCTGC-SH

ssDNA3: TGTGTACTAGGCCGA TGCGA-SH

References

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