

Supplementary Information for

Expanding DNzyme Functionality through Enzyme Cascades with Applications in Single Nucleotide Repair and Tunable DNA-Directed Assembly of Nanomaterials

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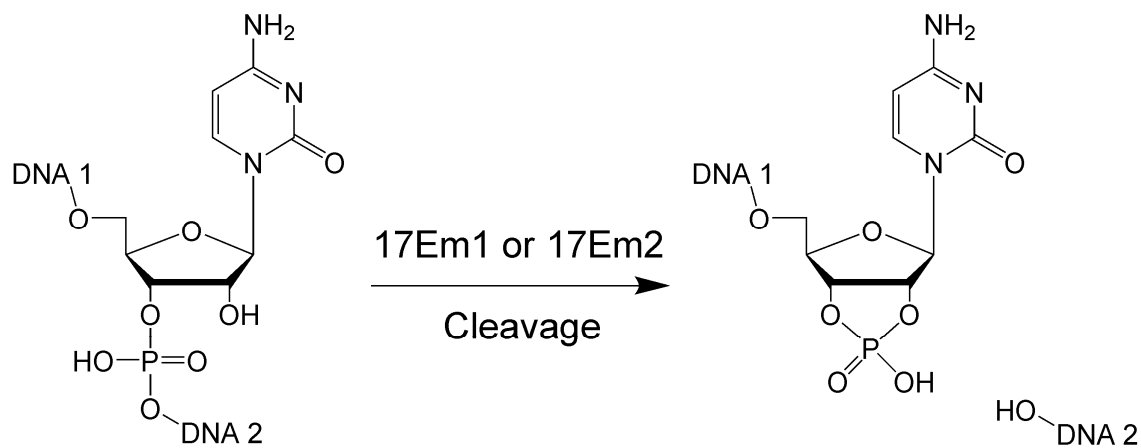


Figure S1a. DNAzyme-catalyzed cleavage of DNA containing a rC linkage.

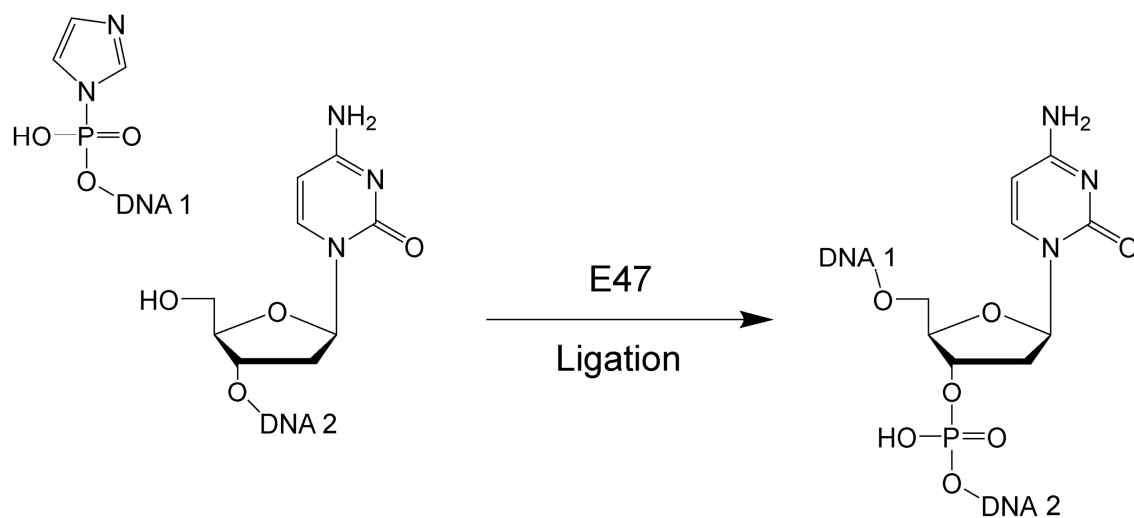


Figure S1b. DNAzyme-catalyzed ligation of DNA activated by imidazole.

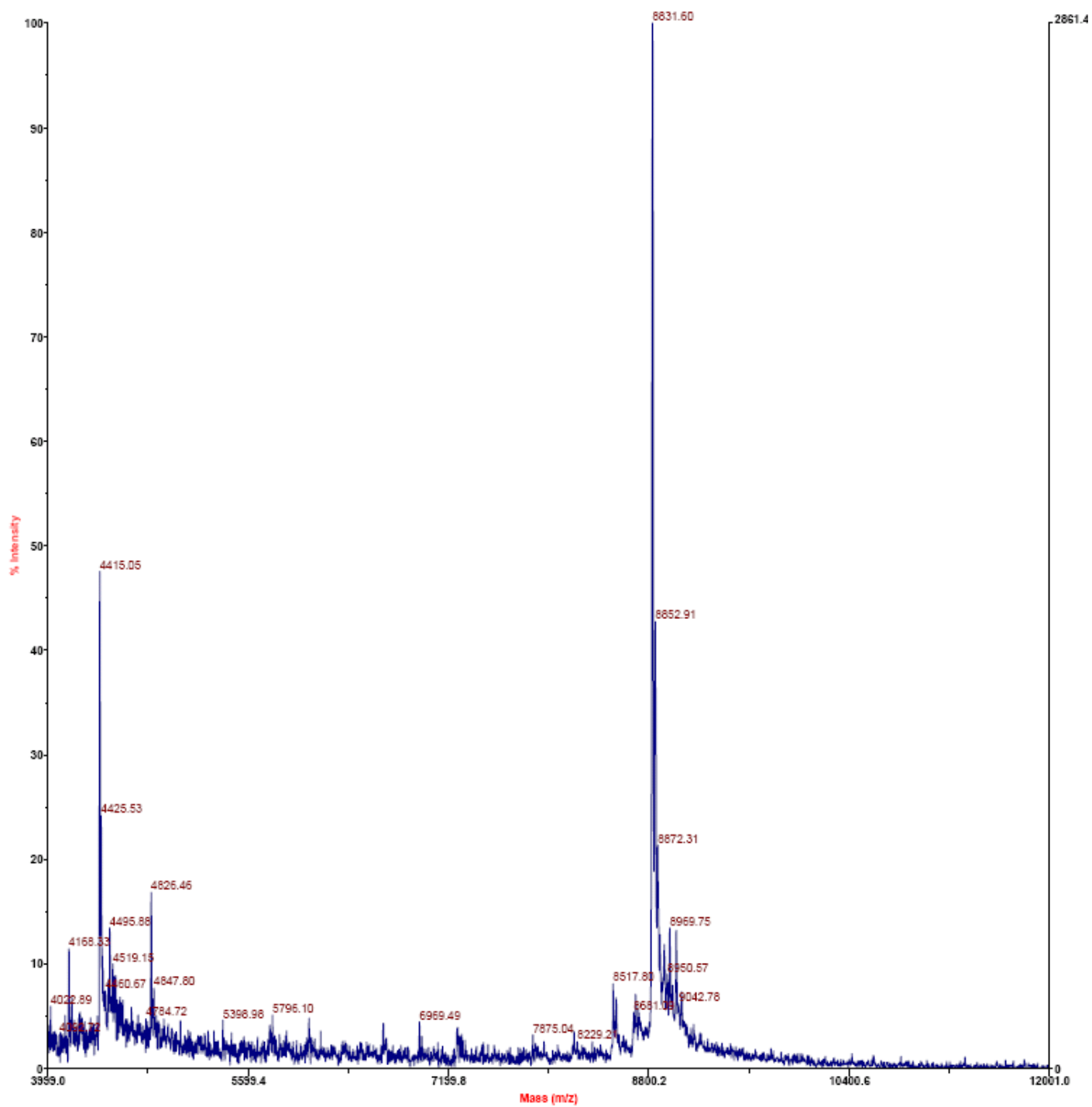


Figure S2a. MALDI-TOF spectrum of O1.

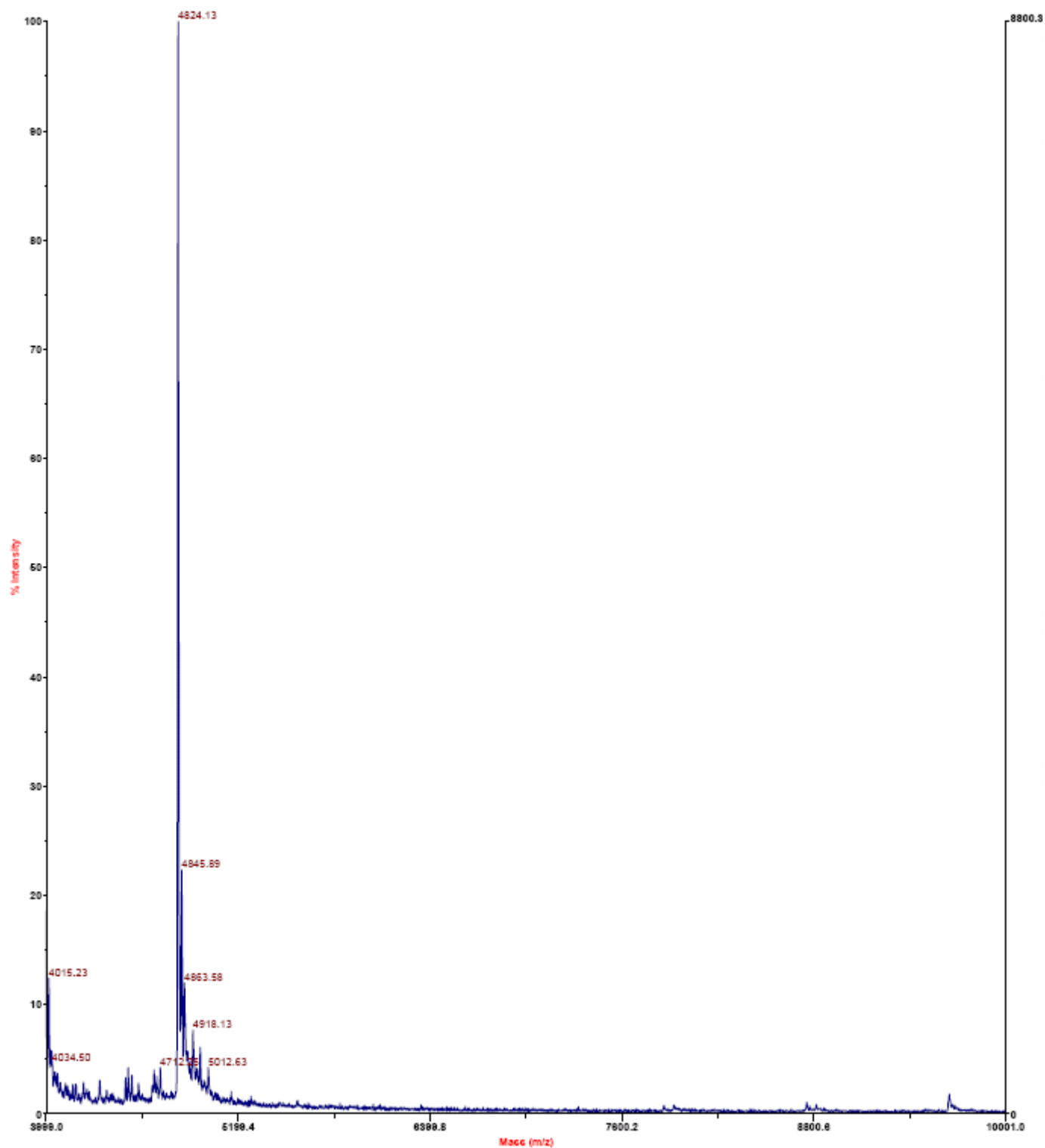


Figure S2b. MALDI-TOF spectrum of O₂.

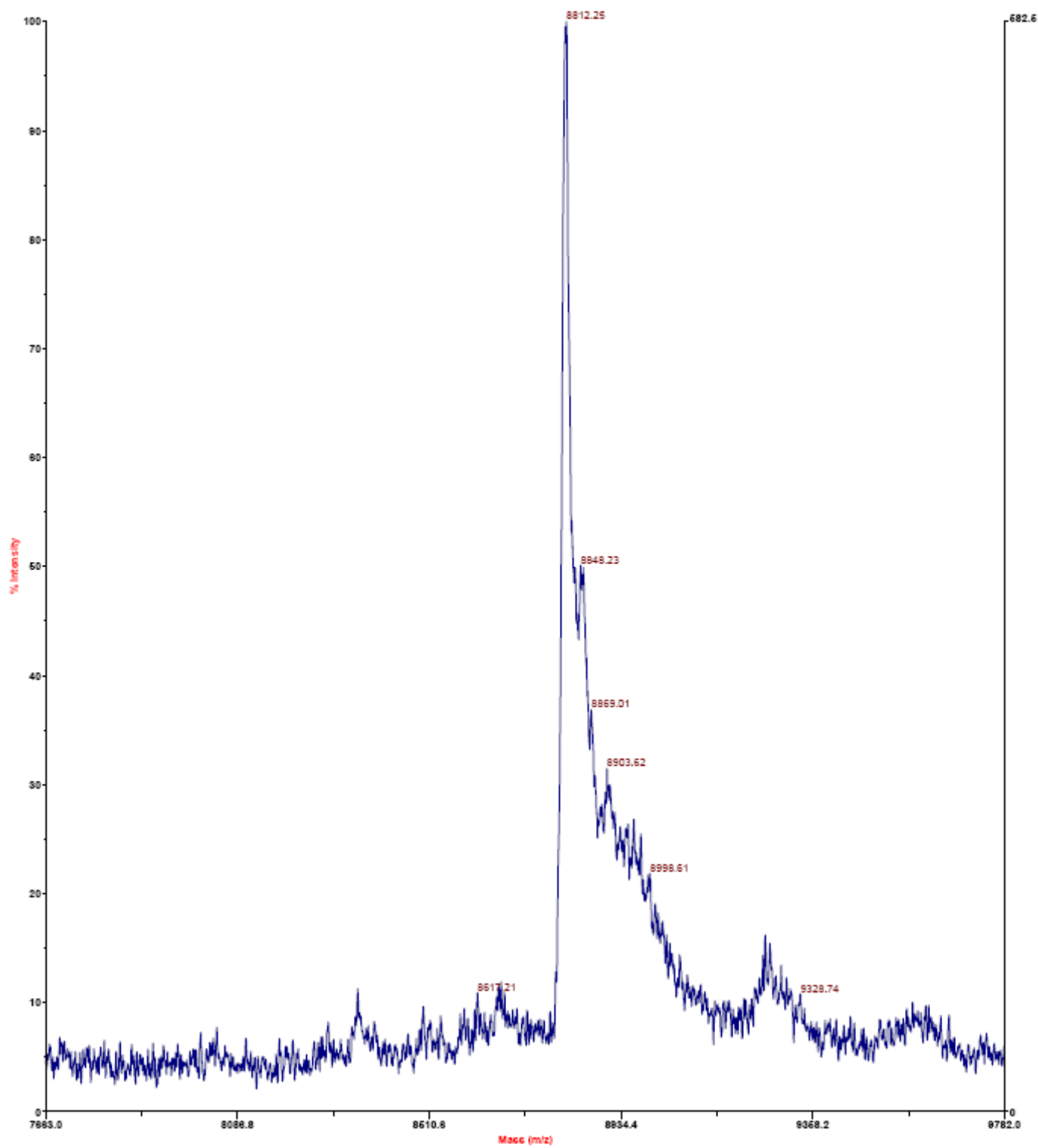


Figure S2c. MALDI-TOF spectrum of O4.

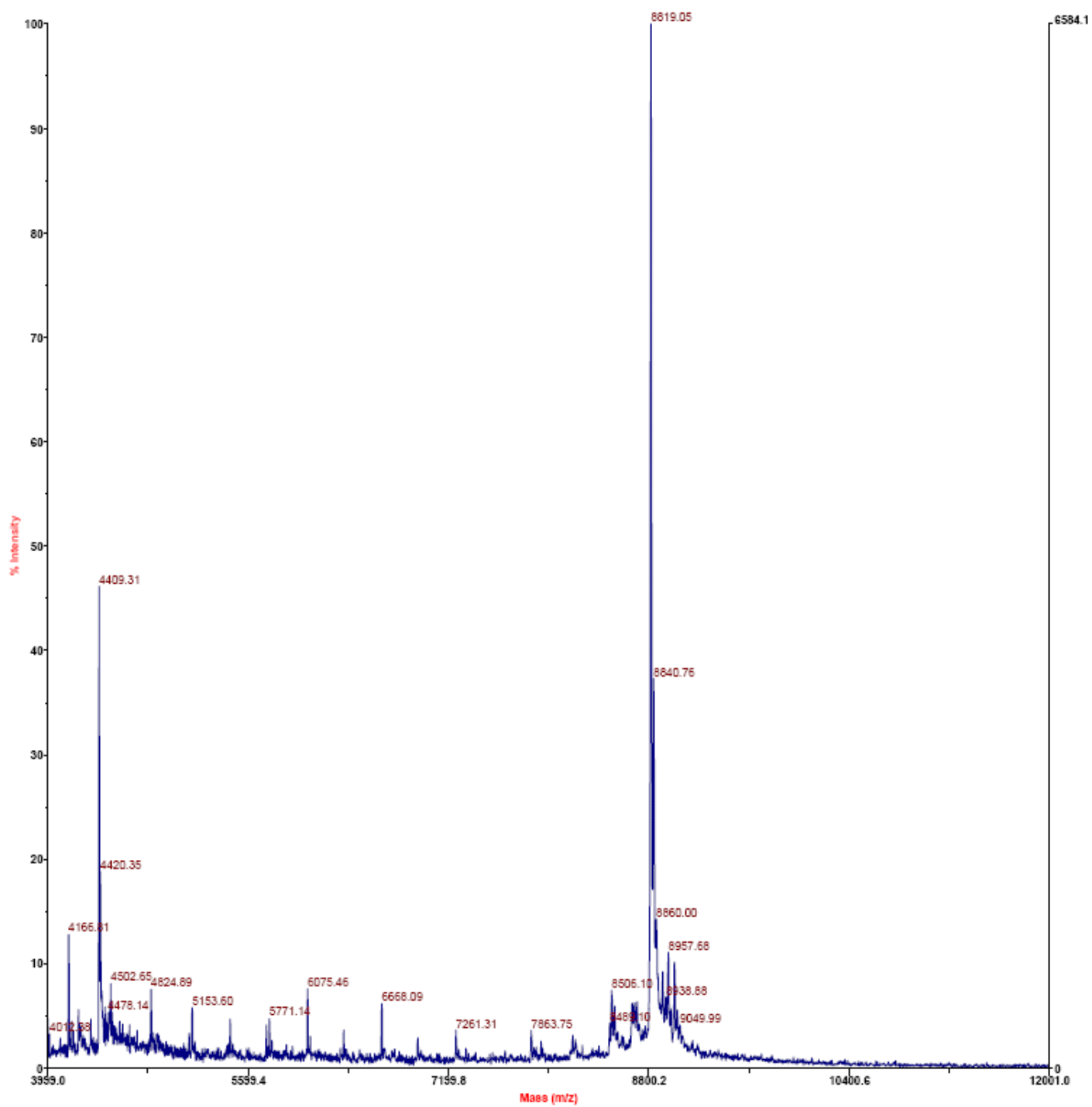


Figure S2d. MALDI-TOF spectrum of O5.

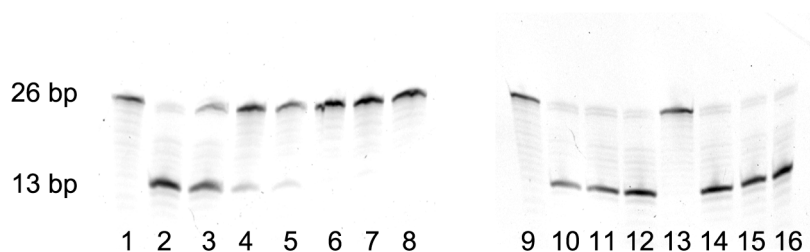


Figure S3. Fluorescent PAGE (20% denatured) images of control experiments: **1**, **O1**; **2**, **O1** in the presence of $17E_{m1}$ and Pb^{2+} ; **3**, **O1** after the excision and recovery of C into rC by $17E_{m1}$ and E47; **4**, **O1** and $17E_{m1}$ in the absence of Pb^{2+} ; **5**, **O1** and $17E_{m2}$ in the presence of Pb^{2+} ; **6**, **O4**; **7** and **8**, **O4** with $17E_{m1}$ and $17E_{m2}$, respectively, in the presence of Pb^{2+} ; **9**, **O1**; **10**, **O1** in the presence of $17E_{m1}$ and Pb^{2+} ; **11**, **10** and E47 in the presence of **O3** and 10 mM EDTA (to remove metal ion cofactors); **12**, **10** and E47 in the presence of Cu^{2+} but absence of **O3**; **13-16**, repeats of **9-12**

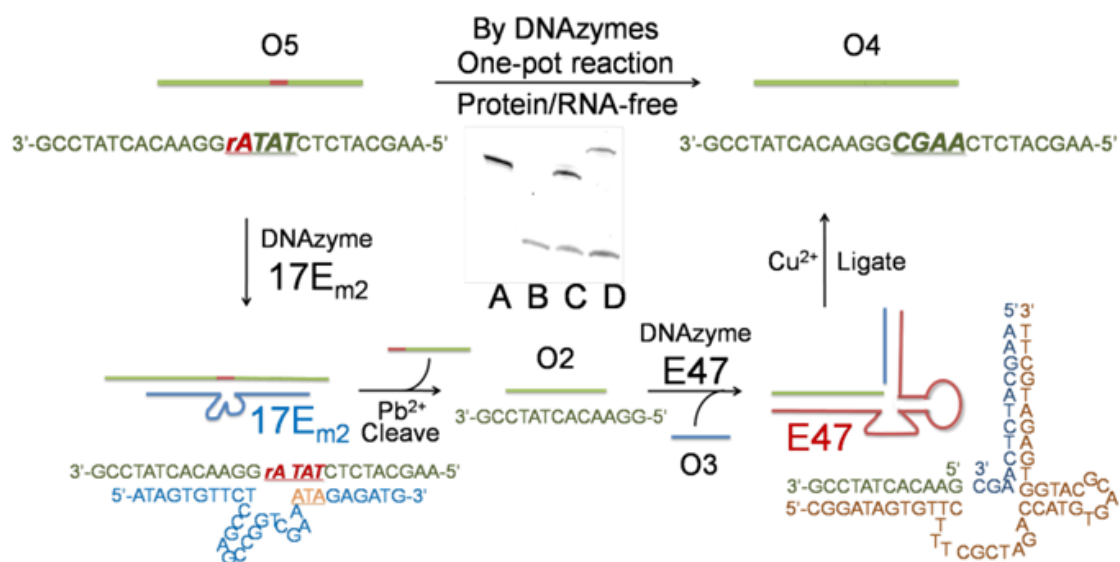


Figure S4. Conversion of ribonucleotide to deoxyribonucleotide in oligonucleotide **O5** by DNAzymes $17E_{m1}$ and E47. Inset is the fluorescent PAGE image of 3'-fluorescein-labeled **O1** (lane A), cleavage product **O2** (lane B), ligation of **O2** with **O3** (lane C) or **O3+8A** (lane D).

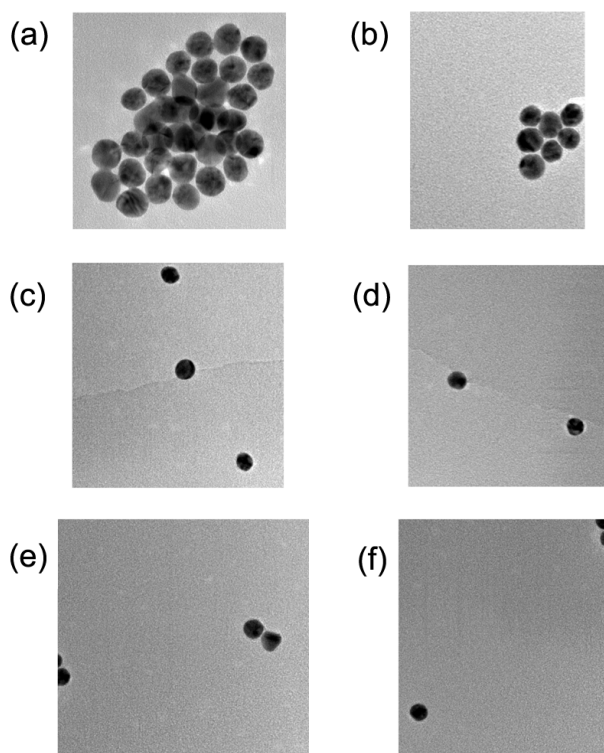


Figure S5. TEM images of **O6**-, **O7**- or **O8**-functionalized AuNPs in the presence of **O9**- or **O10**-functionalized AuNPs, respectively. (a) **O6**-AuNPs + **O9**-AuNPs; (b) **O7**-AuNPs + **O10**-AuNPs; (c) **O6**-AuNPs + **O10**-AuNPs; (d) **O7**-AuNPs + **O9**-AuNPs; (e) **O8**-AuNPs + **O9**-AuNPs; (f) **O8**-AuNPs + **O10**-AuNPs. For the DNA sequences of **O6**~**O10**, see Figure 4 in the article.

Table S1. Ratio of absorbance (A_{700}/A_{532}) as the indication of DNA-directed assembly formation ($A_{700}/A_{532} > 0.50$) for DNA-functionalized gold nanoparticles shown in Figure 5 in the article.

A_{700}/A_{532}	O9 -functionalized AuNPs	O10 -functionalized AuNPs
O6 -functionalized AuNPs	0.68	0.07
O7 -functionalized AuNPs	0.14	0.64
O8 -functionalized AuNPs	0.08	0.09

Table S2. Ratio of absorbance (A_{700}/A_{532}) as the indication of DNA-directed assembly formation ($A_{700}/A_{532} > 0.50$, indicated by stars) for DNA-functionalized gold nanoparticles (A~F) shown in Figure 7 in the article.

A_{700}/A_{532}	A	B	C	D	E	F
O9 -functionalized AuNPs	0.69*	0.08	0.72*	0.07	0.68*	0.06
O10 -functionalized AuNPs	0.63*	0.75*	0.14	0.13	0.54*	0.66*