

Supporting Information

Reversible on-off Photoswitching of DNA Replication Using a Dumbbell Oligodeoxynucleotide

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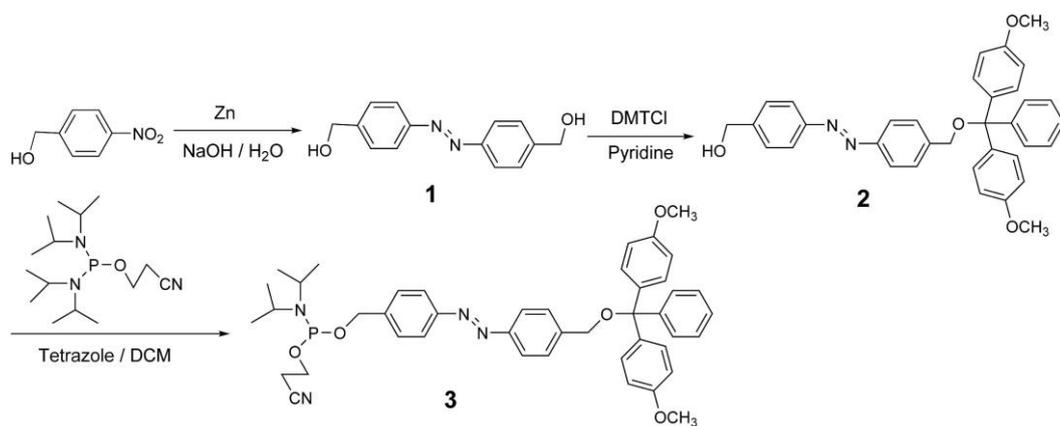


Figure S1. Synthetic procedure of azobenzene phosphoramidite.

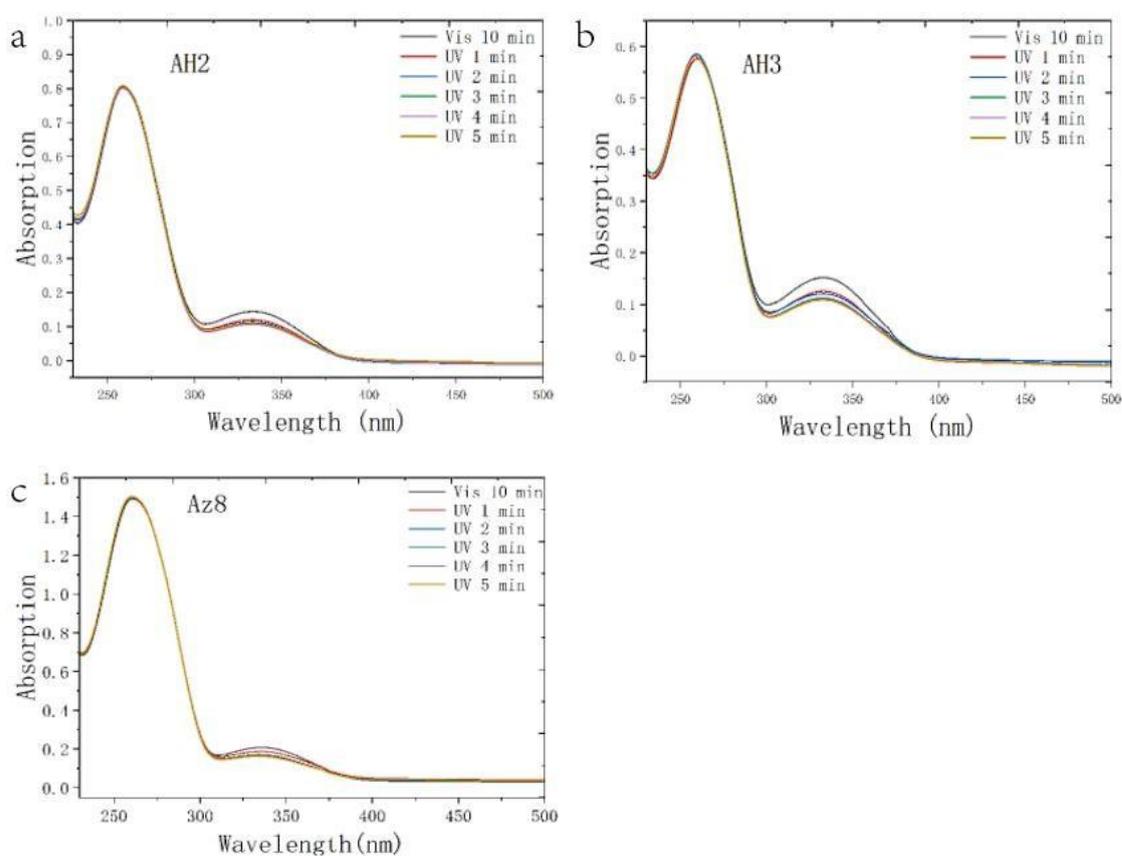


Figure S2. Photoisomerization of asODNs and azODNs. After a wavelength illumination time of 365 nm for 1 min, 2 min, 3 min, 4 min and 5 min, the characteristic absorption peak at asODNs and azODNs 35nm decreased. **a** AAAAGazoCTTTT; **b** AATAGazoCTATT; **c** 5'-GTTGGazoCCAACGTTTCGGACCGTATTazoAATAC-3'.

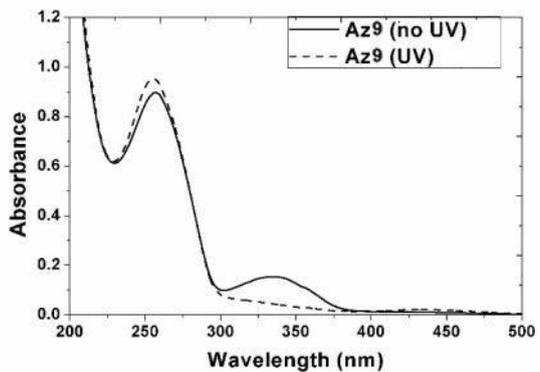
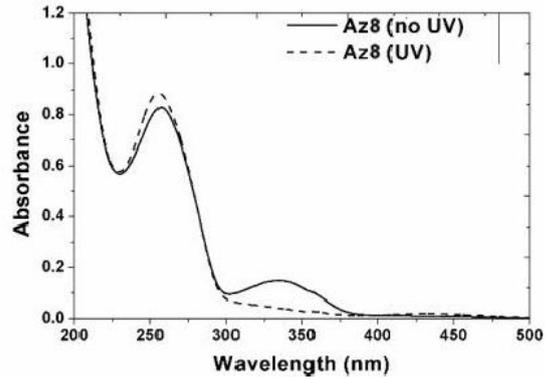
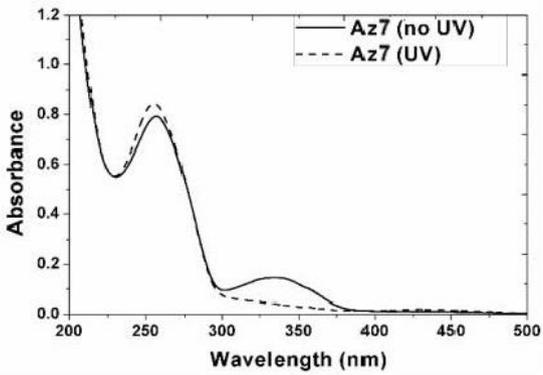
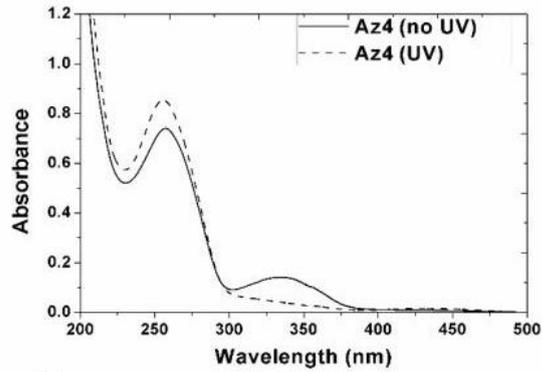
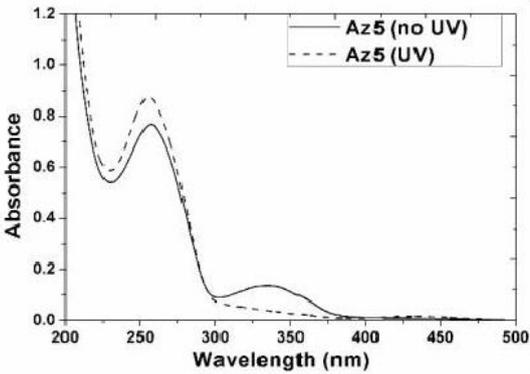
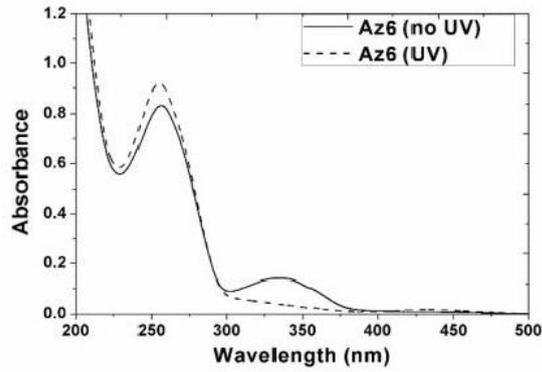
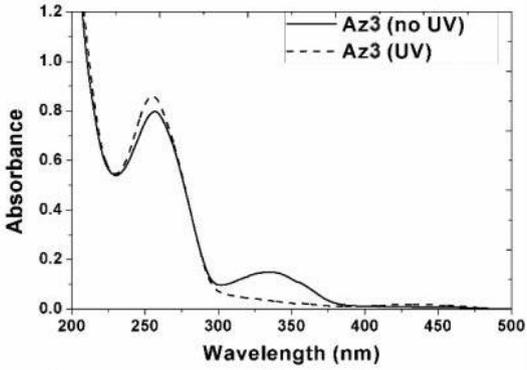
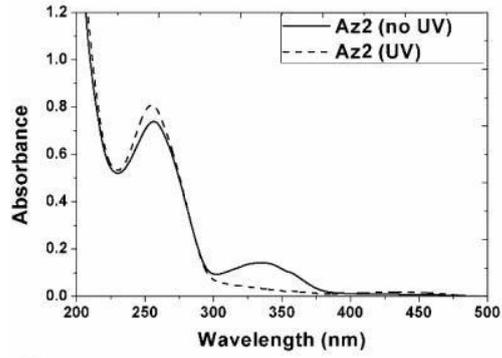
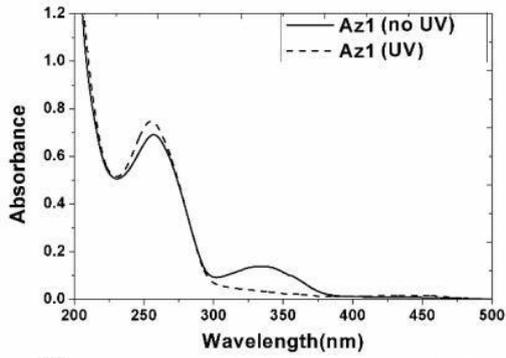


Figure S3. UV/vis absorbance spectra of the respective isomeric forms of all azobenzene linked dumbbell ODNs before and after light illumination for 30 min. The samples (2 μM) were irradiated with UV (365 nm, trans-to-cis) in 1 \times PBS until absorbance changes were no longer observable.

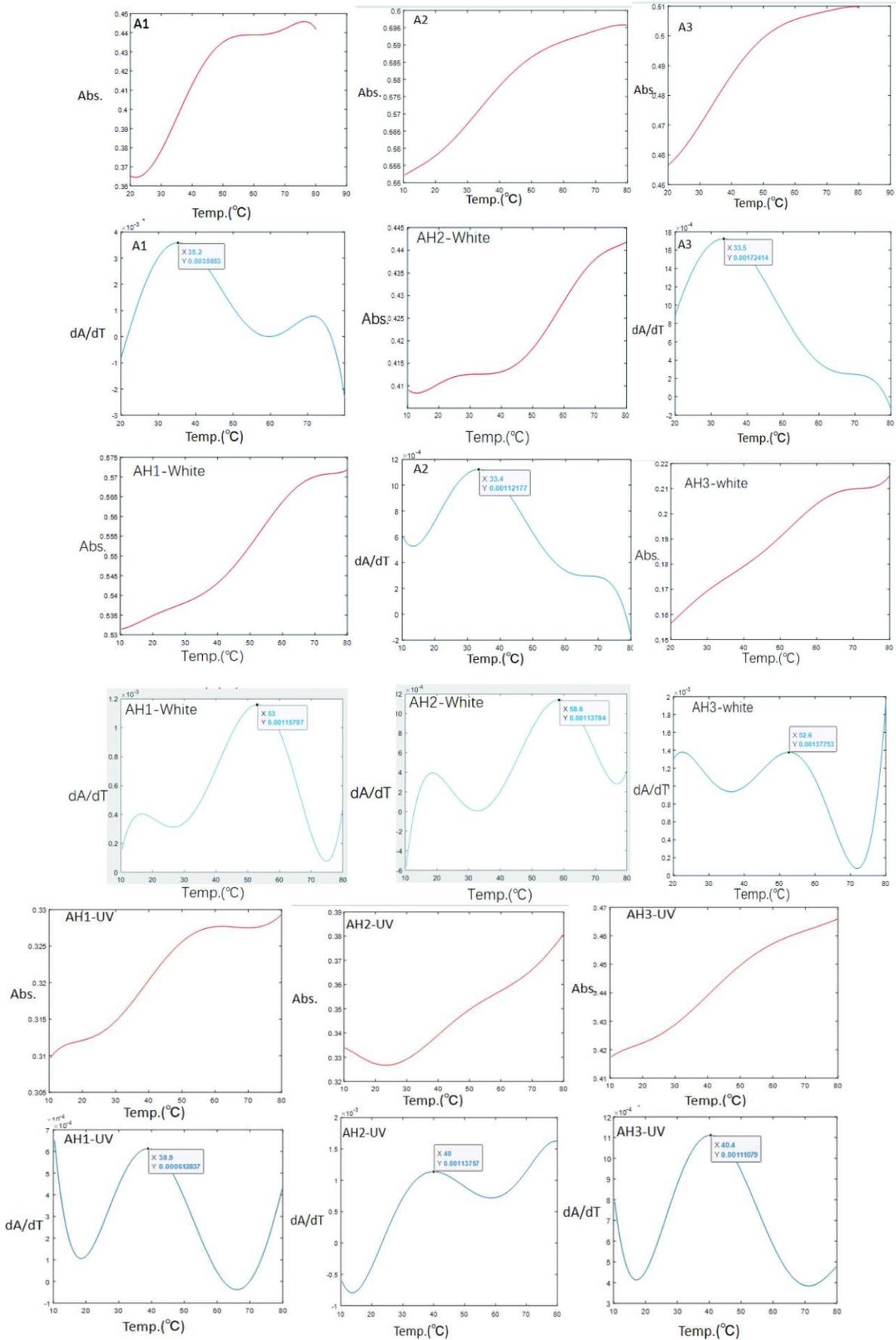
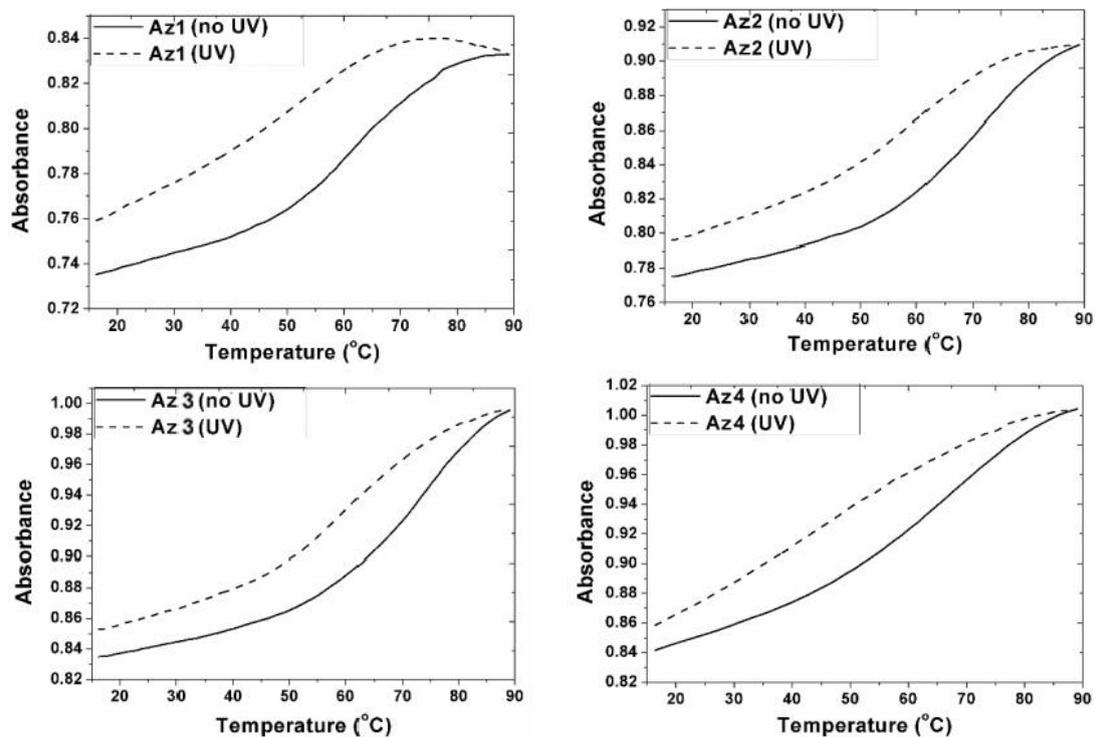


Figure S4 Measure the hairpin azODNs dissolution curve with a variable temperature UV spectrophotometer. AH1, AH2 and AH3 solutions were obtained by detecting the absorption value of 260 nm after 30 minutes of UV or white light illumination, respectively. The matrix software uses the derivative of the discrete function difference to the a-discrete test value.



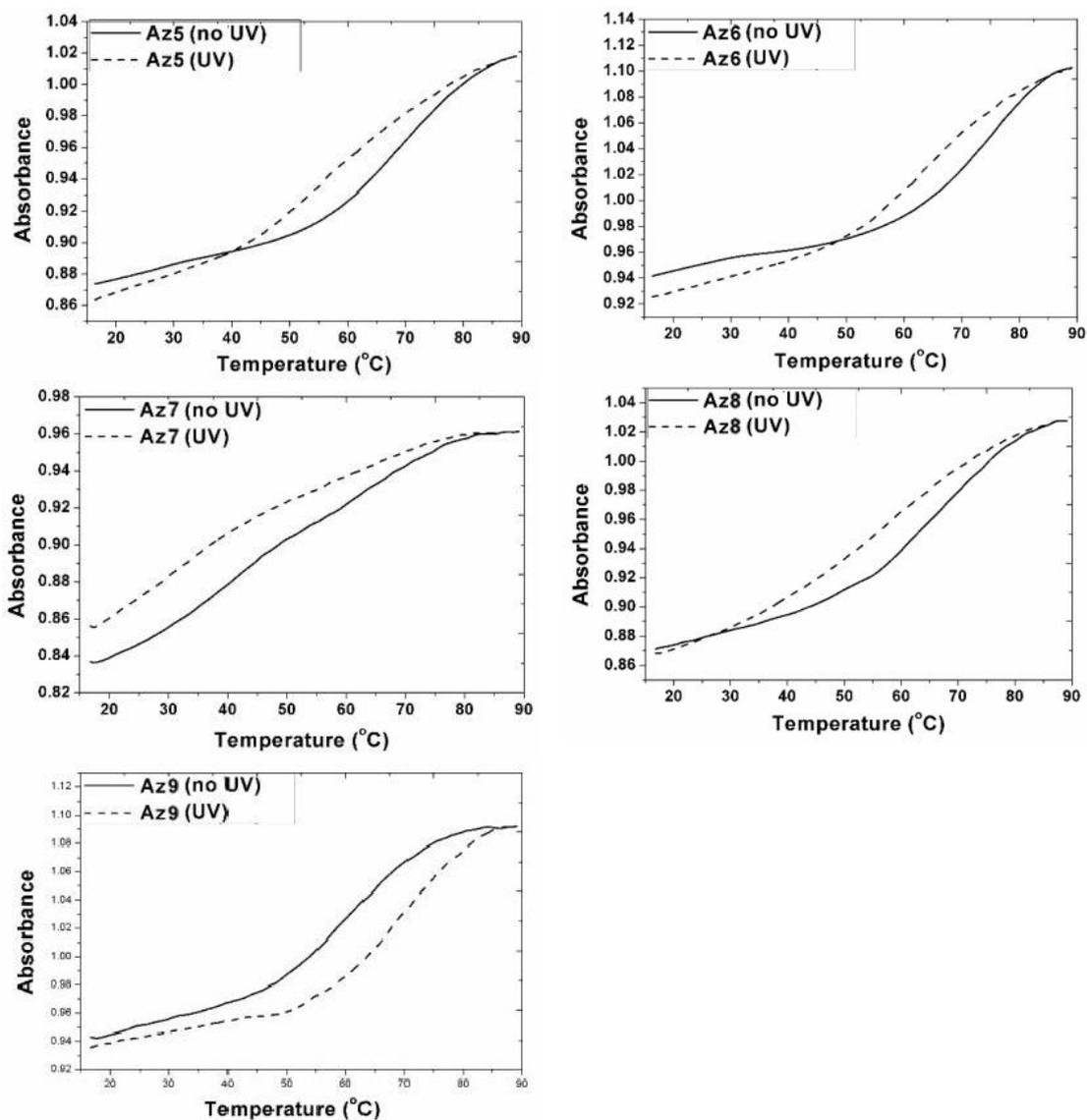


Figure S5 Typical melting curves of all azobenzene linked dumbbell asODNs themselves, and the black and dashed lines present the melting curves before and after irradiation with UV light (365 nm), respectively. UV melting experiments were performed in $1\times$ PBS and ODN concentrations were adjusted to $2\ \mu\text{M}$.

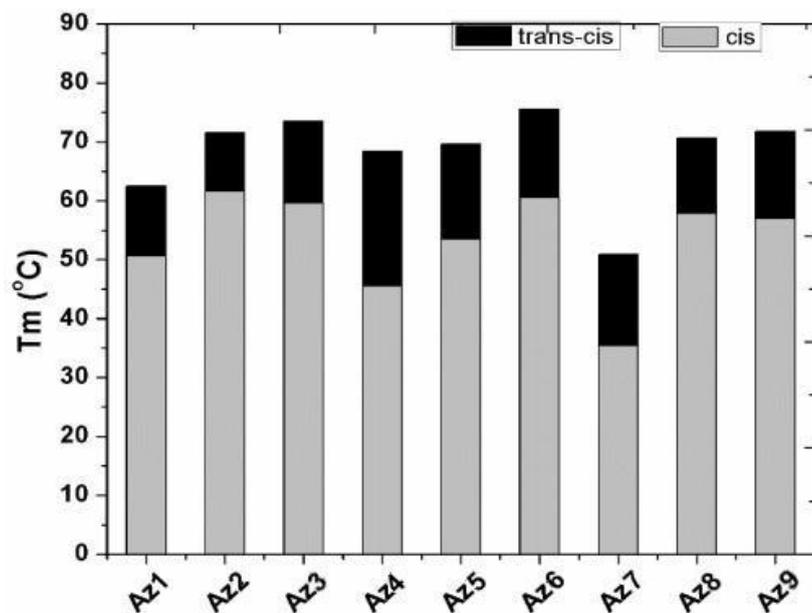


Figure S6. T_m comparison of azobenzene linked dumbbell asODNs before and after UV irradiation. Light gray represents T_m of cis-azobenzene linked ODNs, and black represents T_m of trans-azobenzene linked ODNs deducting that of the corresponding cis conformation.

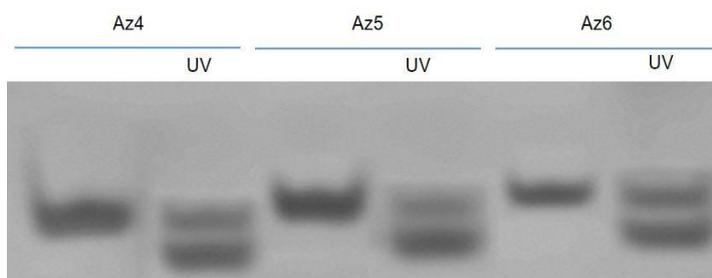
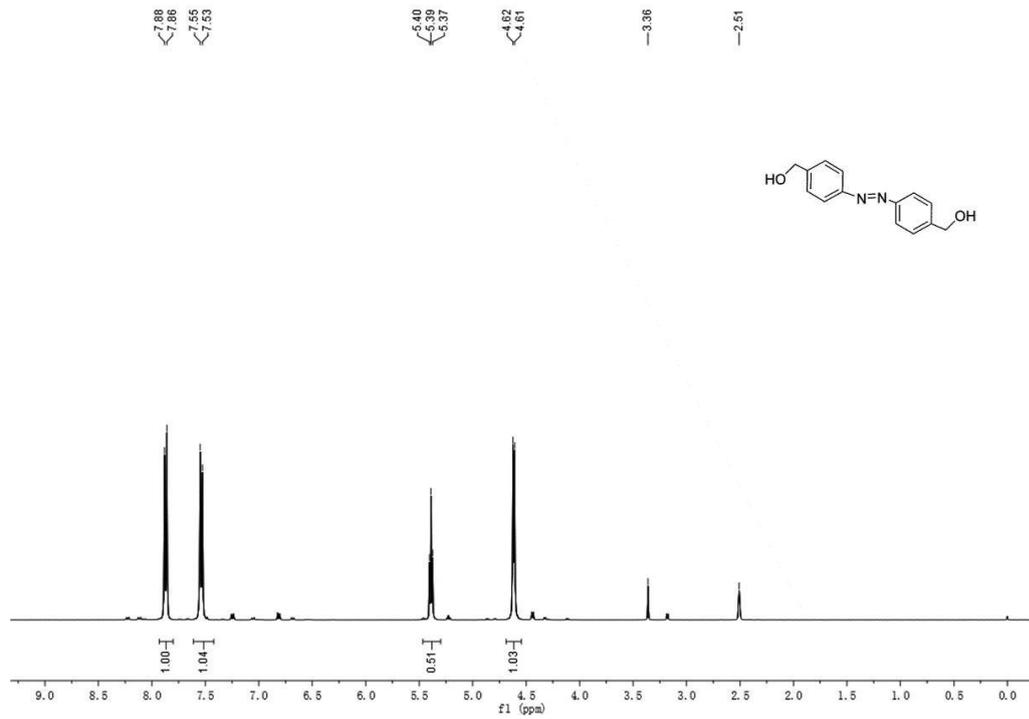
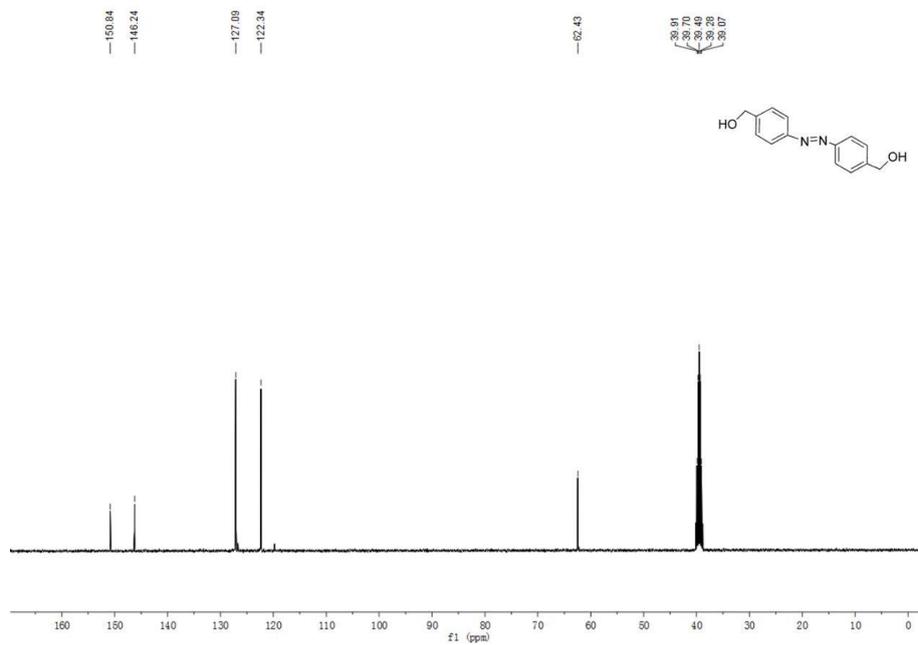


Figure S7 Comparison of natural polyacrylamide gel electrophoresis strips with light azobenzene linked to dumbbell nucleic acid (365 nm). The samples from left to right were corresponding to trans-Az4, cis-Az4, trans-Az5, cis-Az5, trans-Az6, cis-Az6.

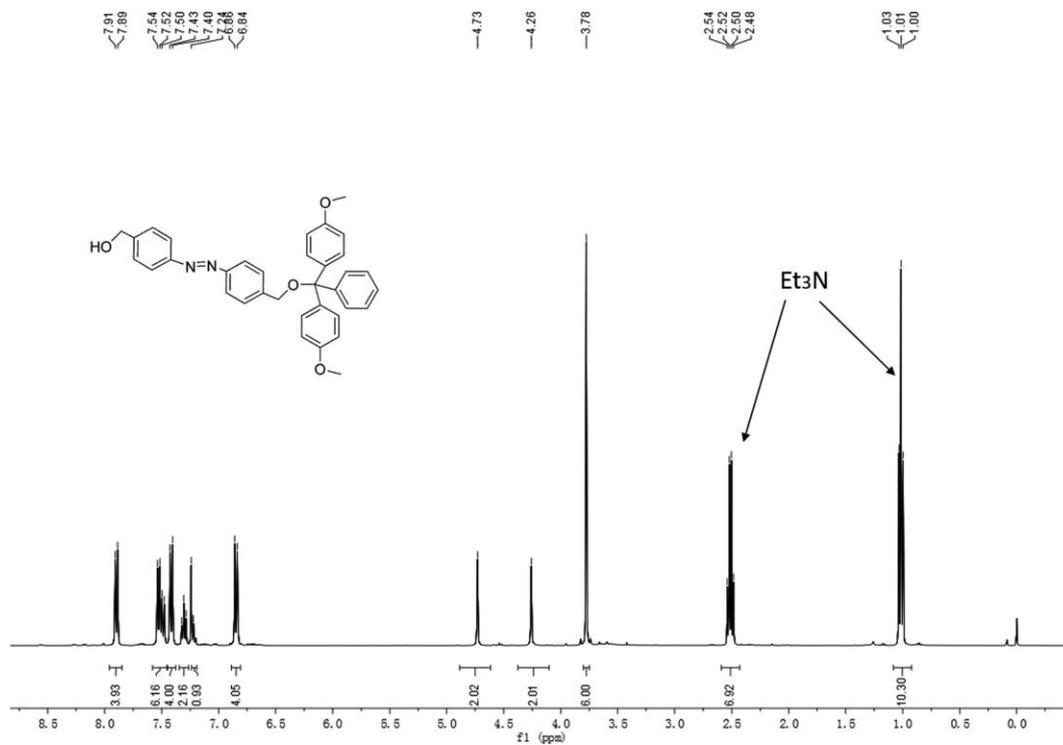
¹H NMR Spectra of Compound 1



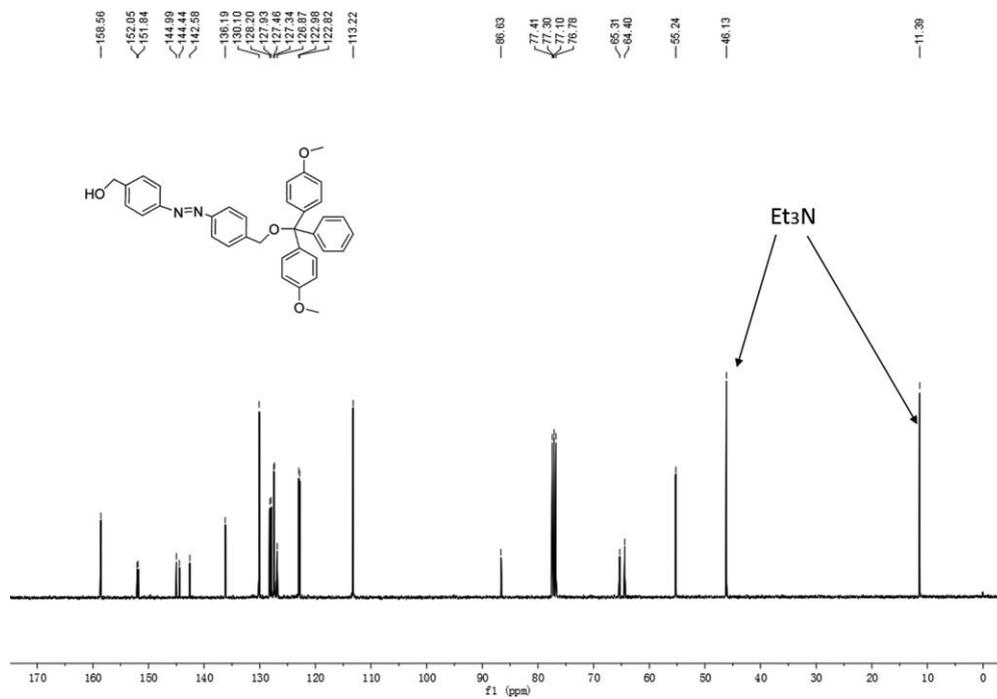
¹³C NMR Spectra of Compound 1



¹H NMR Spectra of Compound 2



¹³C NMR Spectra of Compound 1



³¹P NMR Spectra of Compounds

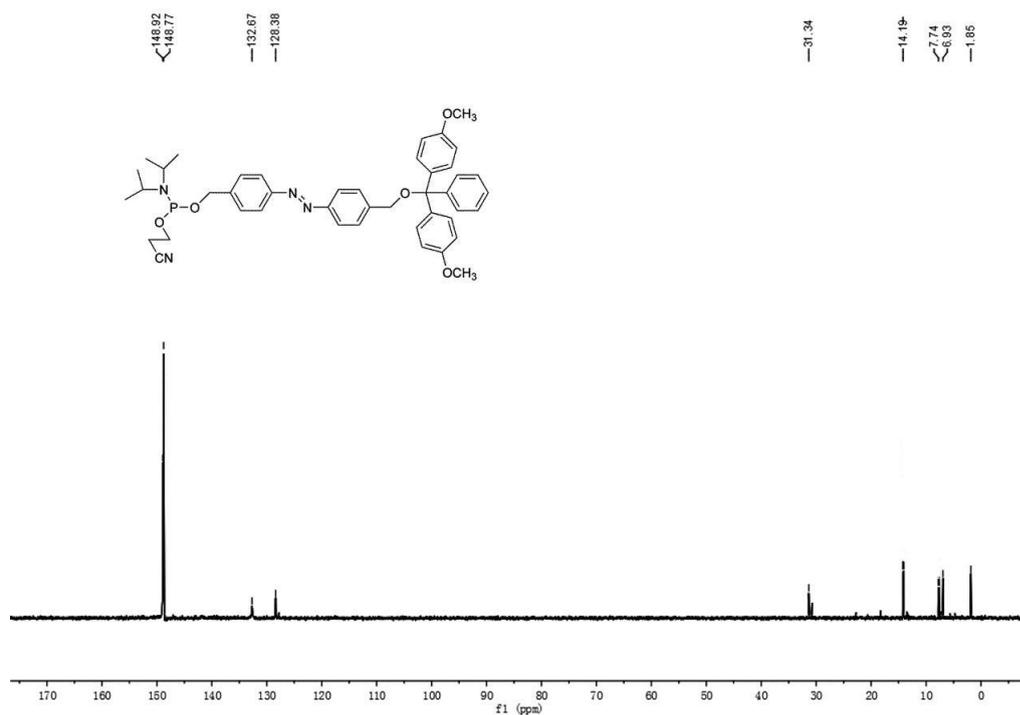


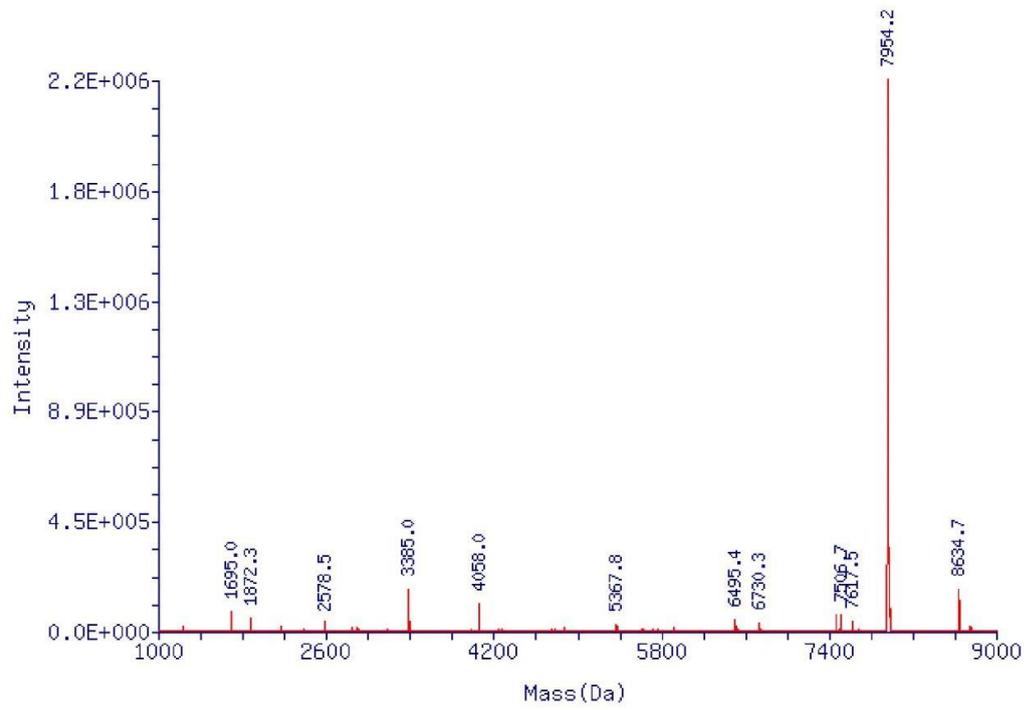
Figure S8. ^1H , ^{13}C , ^{31}P NMR Spectra of Compounds.

Table S1. Values for ESI-MS of azobenzene linked dumbbell asODNs.

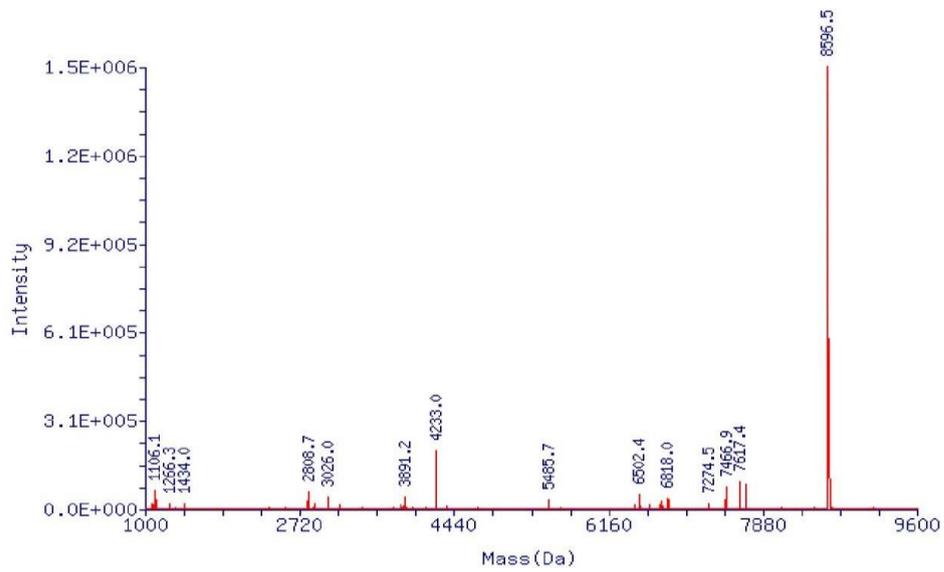
Name	Sequence	Calculated	Found
Az1	5'-CGTT azo AACGTTTCGGACCGTA azo TACG-3'	7952.31	7954.2
Az2	5'-ACGTT azo AACGTTTCGGACCGTA azo TACGG-3'	8594.73	8596.5
Az3	5'-AACGTT azo AACGTTTCGGACCGTA azo TACGGT-3'	9212.14	9213.0
Az4	5'-GTT Gazo CAACGTTTCGGACCGTAT azo ATAC-3'	8569.72	8571.4
Az5	5'-CGTT Gazo CAACGTTTCGGACCGTAT azo ATACG-3'	9188.11	9190.1
Az6	5'-ACGTT Gazo CAACGTTTCGGACCGTAT azo ATACGG-3'	9830.53	9832.1
Az7	5'-TTGG azo CCAACGTTTCGGACCGTATT azo AATA-3'	9187.13	9188.2
Az8	5'-GTTGG azo CCAACGTTTCGGACCGTATT azo AATAC-3'	9805.52	9807.1
Az9	5'-CGTTGG azo CCAACGTTTCGGACCGTATT azo AATACG-3'	10423.91	10426.1

Figure S9 ESI-MS spectra of azobenzene linked dumbbell asODNs.

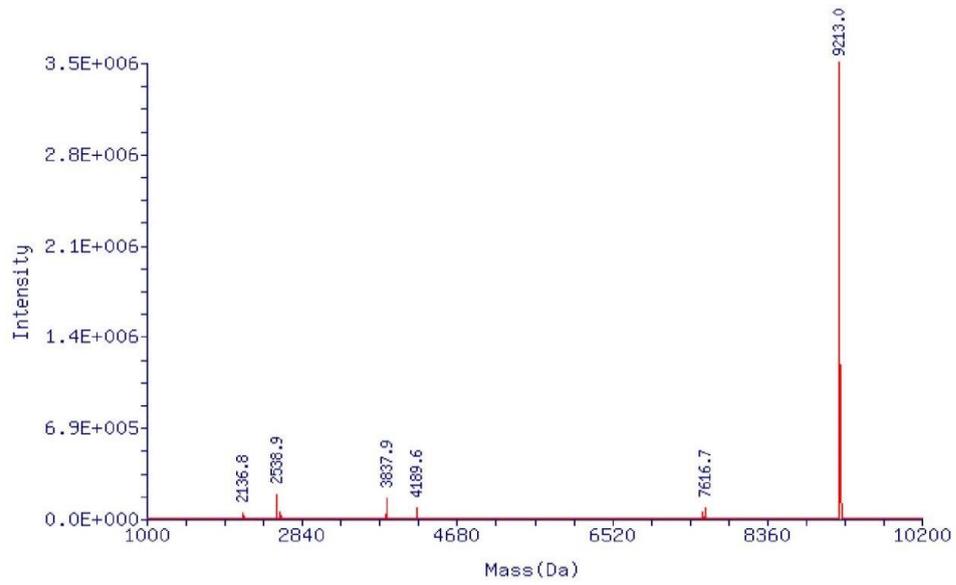
Az1



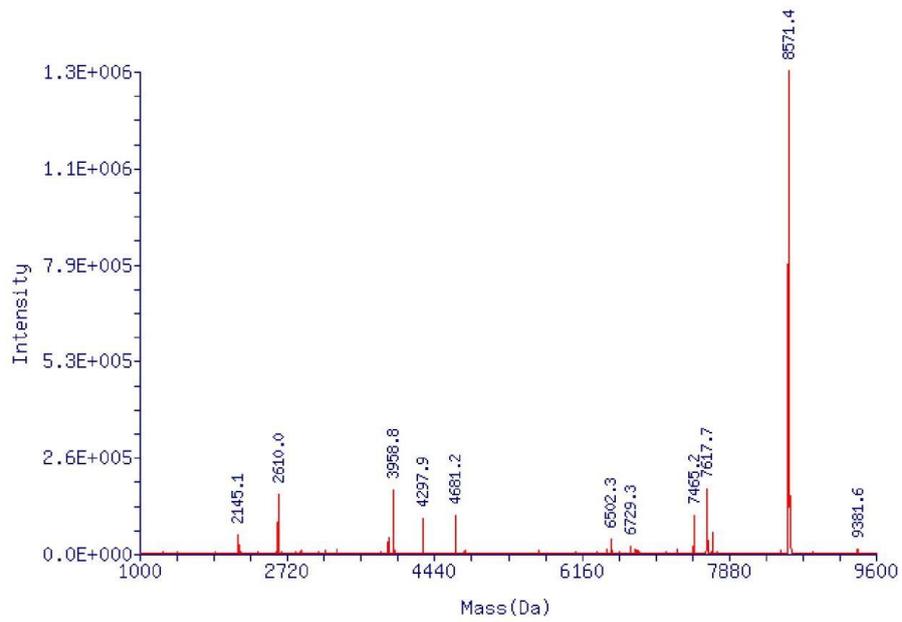
Az2



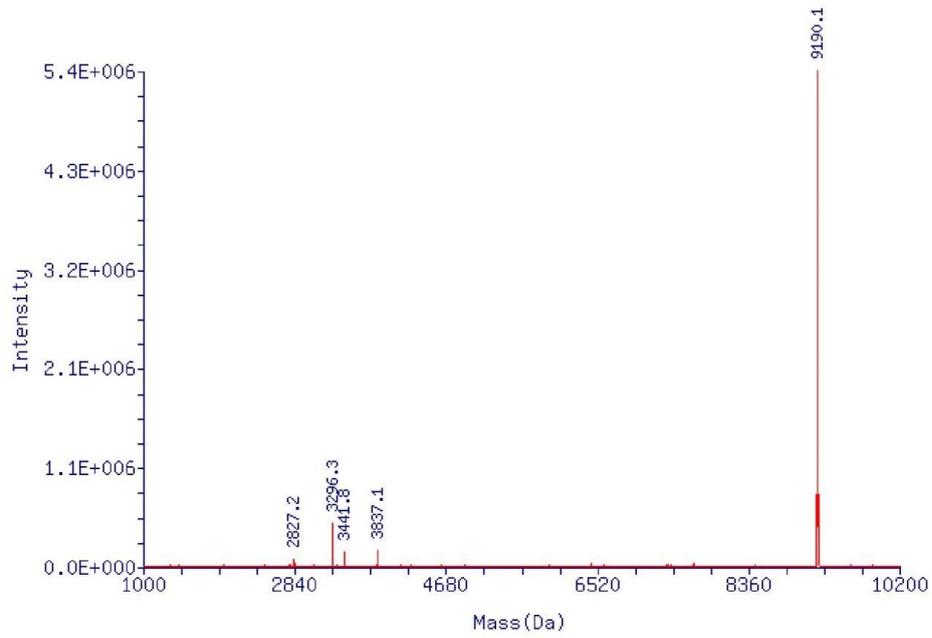
Az3



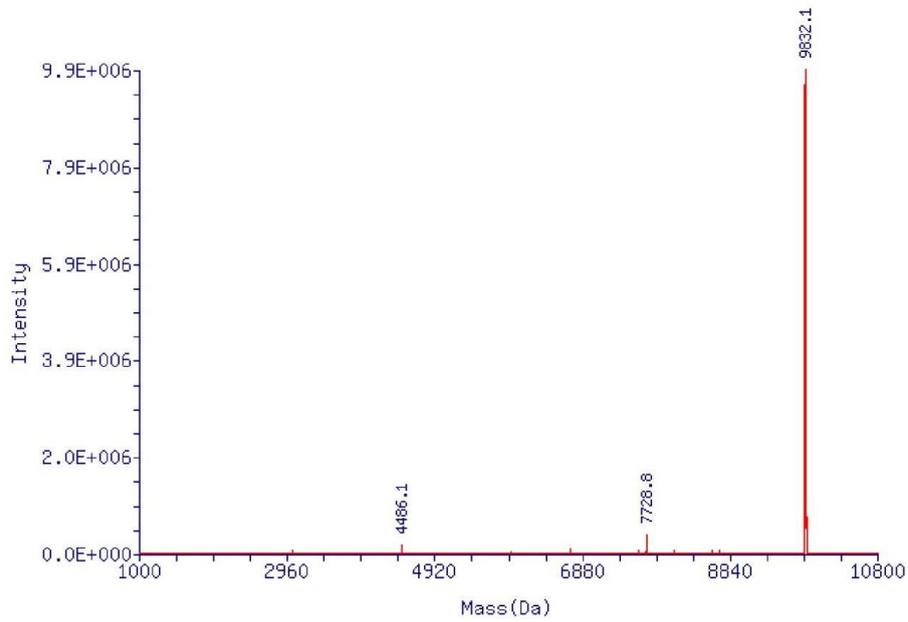
Az4



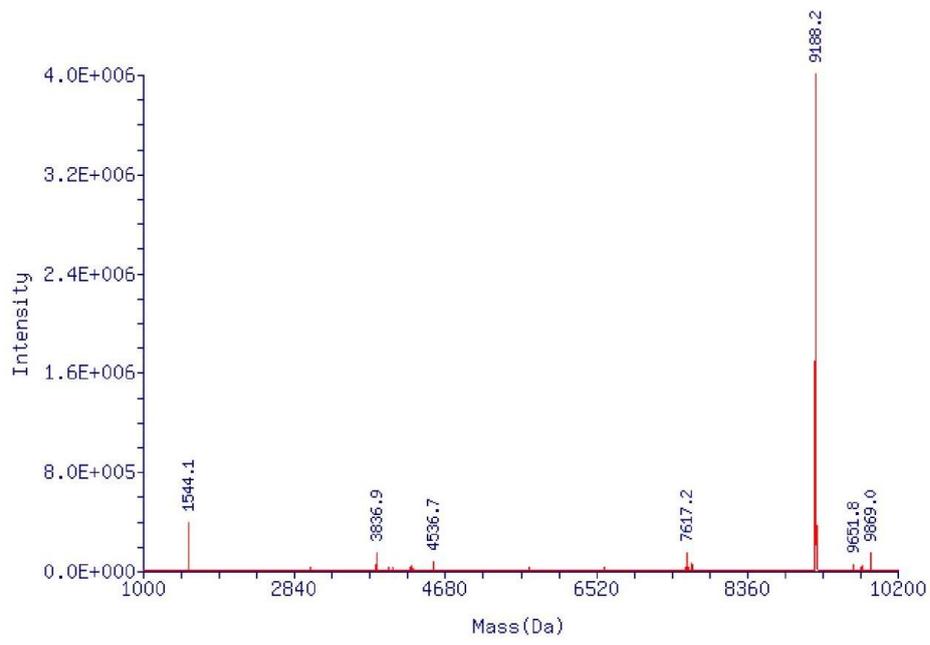
Az5



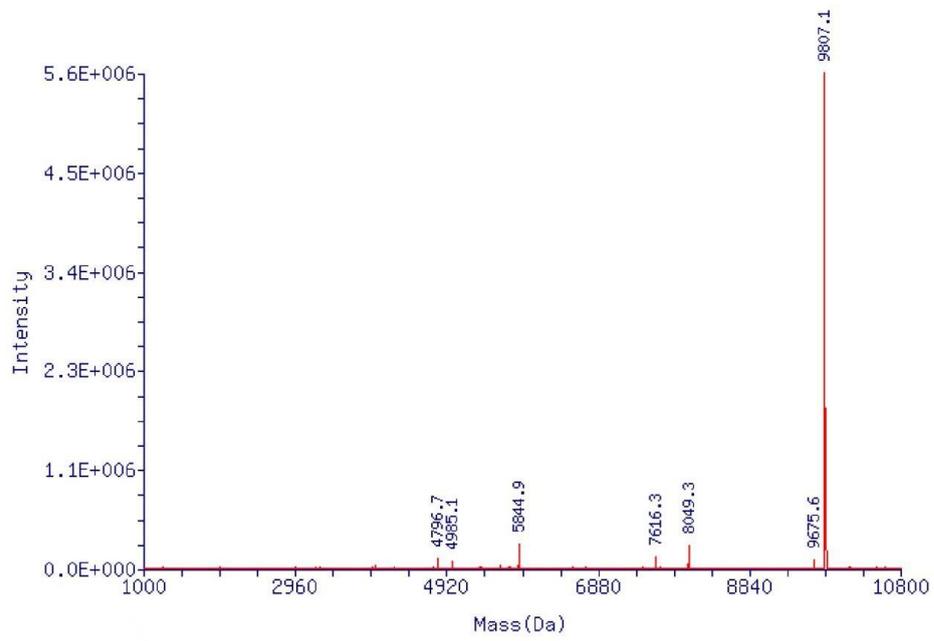
Az6



Az7



Az8



Az9

