Electronic Supplementary Information

Multi-responsible Chameleon Molecule with Chiral Naphthyl and Azobenzene Moieties

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Characterization data

Chemical structures and purities of NCA_2M and its intermediates were confirmed by thin layer chromatography (TLC), ^1H NMR, and ^{13}C NMR in deuterated chloroform ($CDCl_3$). All the chemical compounds synthesized in this research were purified by recrystallization and/or column chromatography using the silica gel. Chemical shifts were quoted in part per million (ppm) with a reference of tetramethylsilane (TMS).

Chemical structure of compound 4-(4-pentylphenylazo)phenol (**1**) was identified by increased integration of protons at azobenzene groups (7.76-6.92 ppm, 8H). The protons of ether (-O-C**H$_2$**-, 2H) in compound 4-(6-bromohexyloxy)phenyl-(4-pentylphenyl)diazene (**2**) appeared at 4.04 ppm. Chemical structure of compound 3,5-bis[6-(4-(4-pentylphenylazo)phenoxy)hexyloxy]benzoic acid ethyl ester (**3**) was identified by new peak at 7.16 ppm (-C-C**H**-C-, 2H), 6.64 ppm (-C-C**H**-C-, 1H) and 3.89 ppm (-O-C**H$_3$**, 3H) as a singlet from methyl benzoate. Chemical structure of compound 3,5-bis[6-(4-(4-pentylphenylazo)phenoxy)hexyloxy]benzoic acid (**4**) was confirmed from the disappearance of methyl group in ester adjacent to the benzoate. Chemical structure of NCA_2M was identified by increased integration of protons and a new peak at around 1.84 ppm (-CH-C**H$_3$**, 3H) corresponding to the chiral naphthyl group.

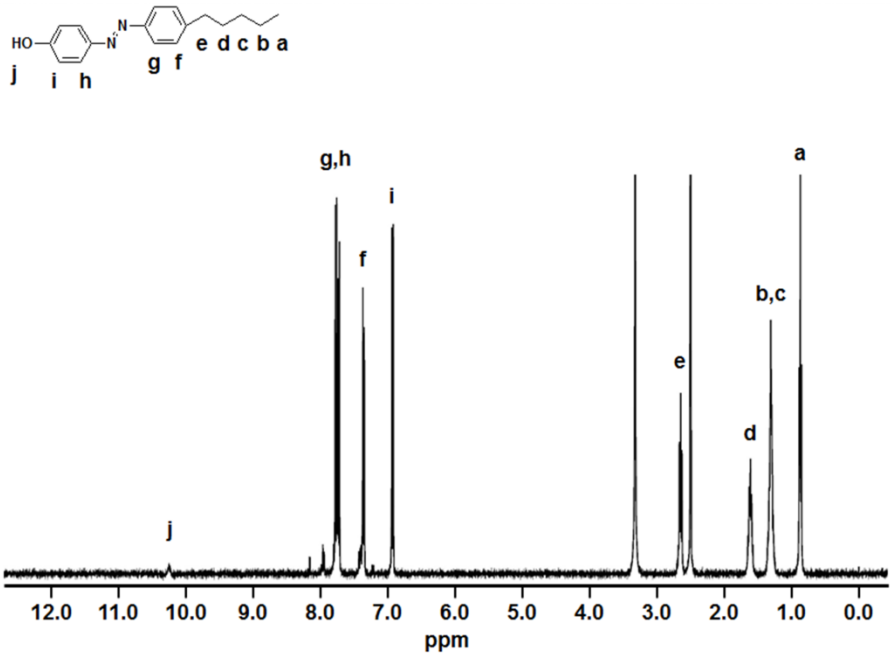

Fig. S1 ^{1}H NMR spectrum of compound **1**

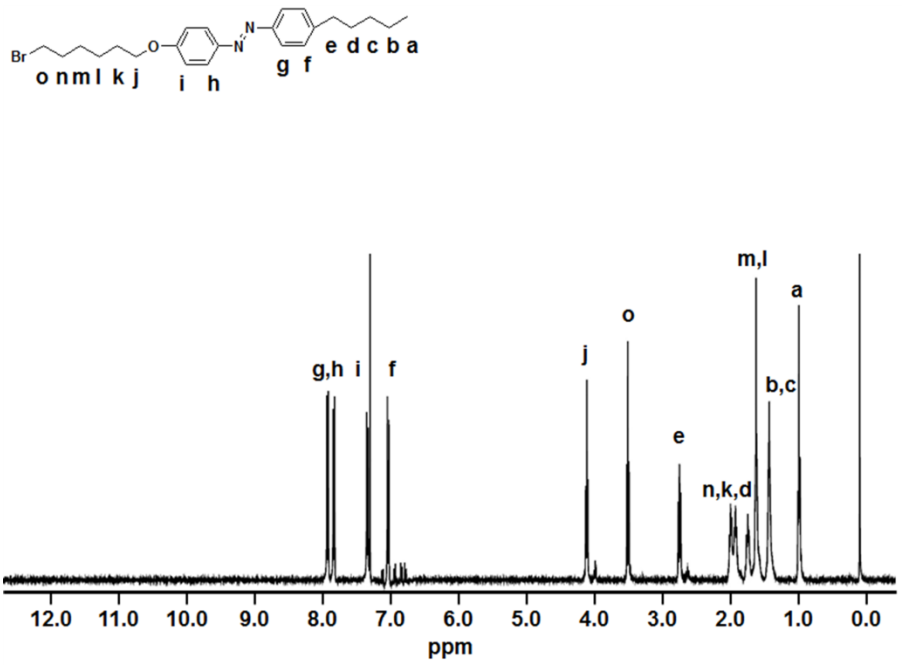

Fig. S2 ^{1}H NMR spectrum of compound **2**

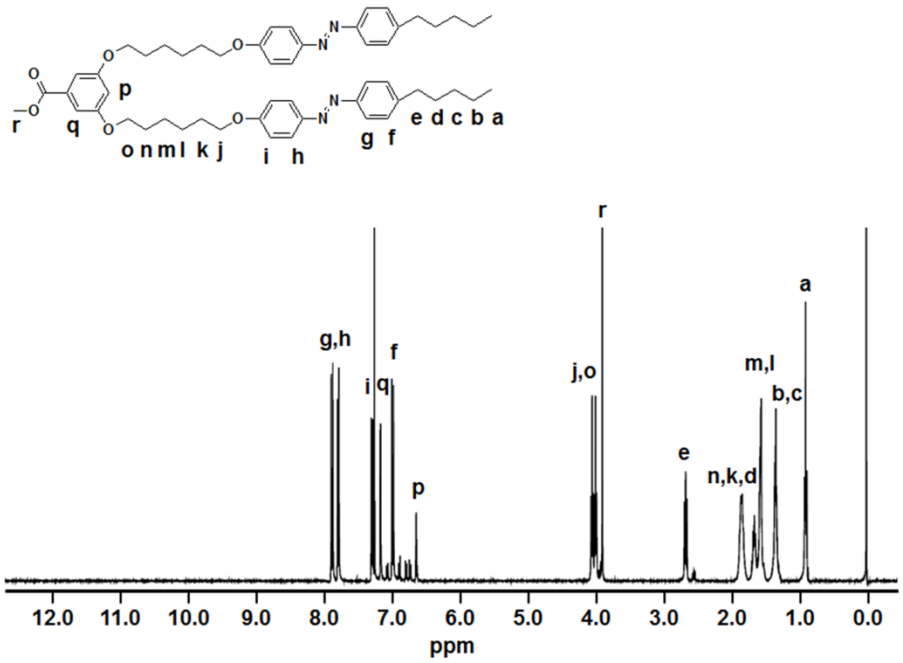

Fig. S3 ^{1}H NMR spectrum of compound **3**

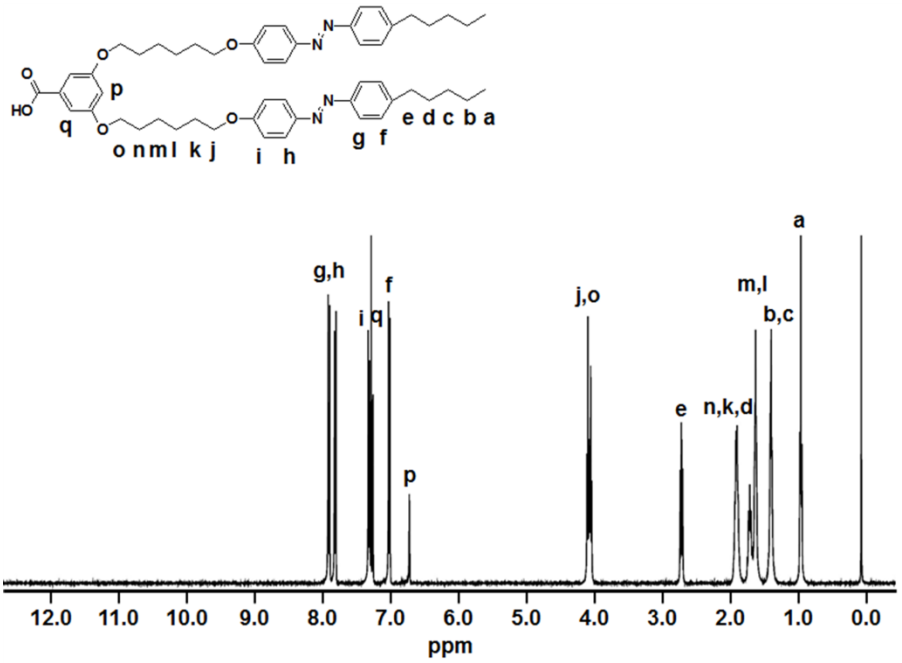

Fig. S4 ^{1}H NMR spectrum of compound **4**

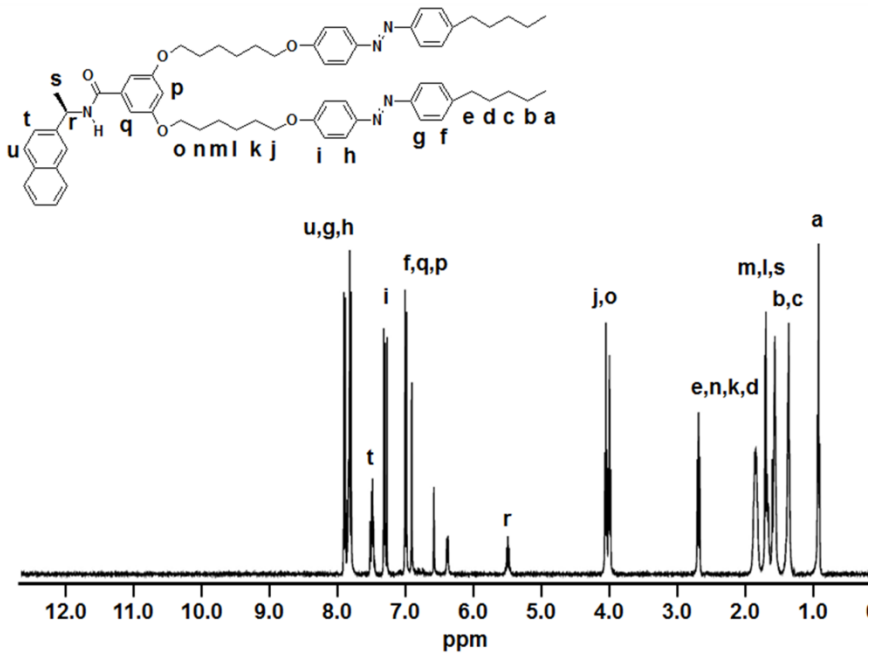

Fig. S5 ^{1}H NMR spectrum of compound NCA_2M

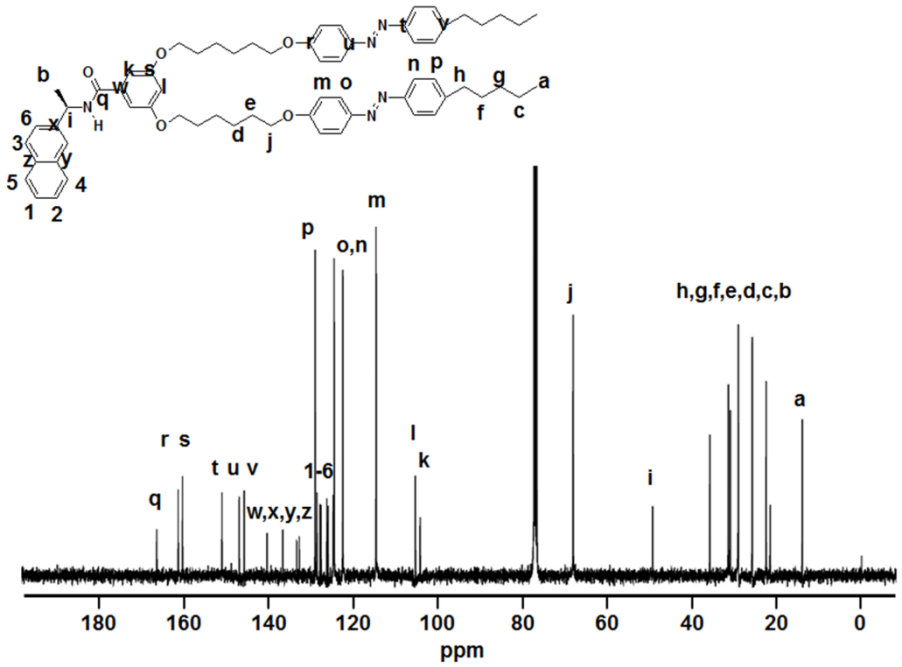

Fig. S6 ^{13}C NMR spectrum of compound NCA_2M

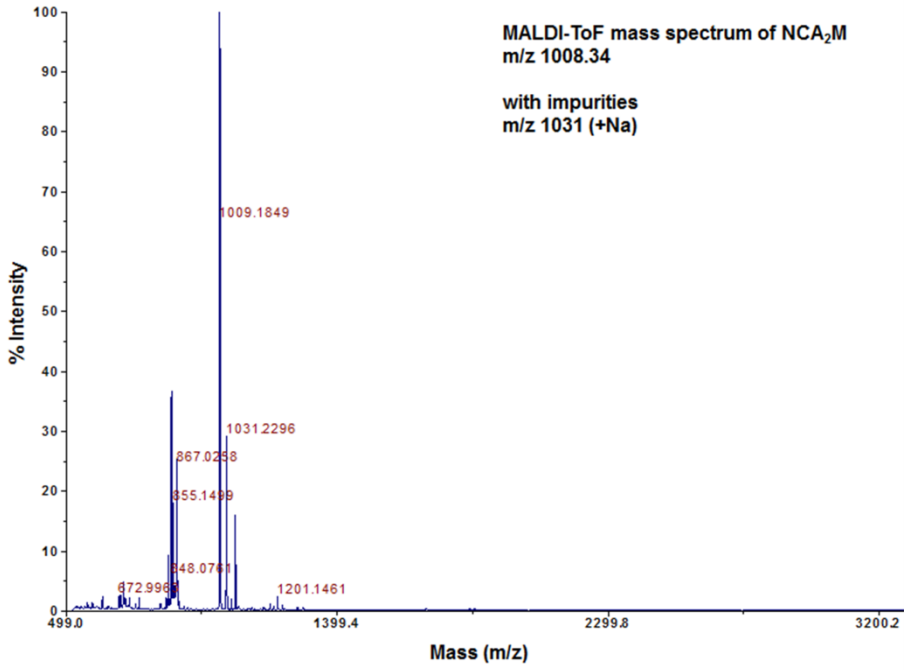

Fig. S7 MALDI-ToF MS spectrum of compound NCA_2M

	Experimental Content (%)	Calculated Content (%)
C	76.57 76.67 77.06	77.42
H	7.78 7.49 7.71	7.70
N	6.98 6.95 6.94	6.95

Fig. S8 Elemental analysis of compound NCA_2M

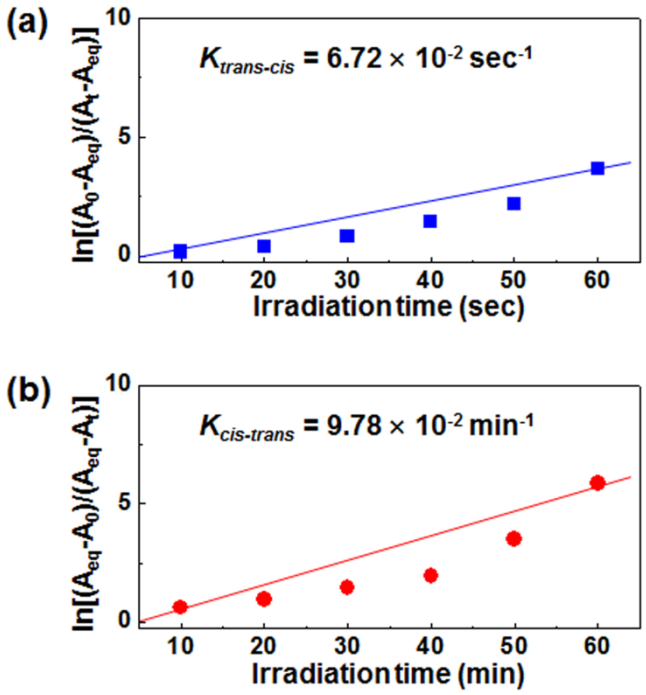

Fig. S9. The first-order plots of the *trans-cis* (a) and *cis-trans* photo-isomerization (b) of NCA_2M in chloroform solution

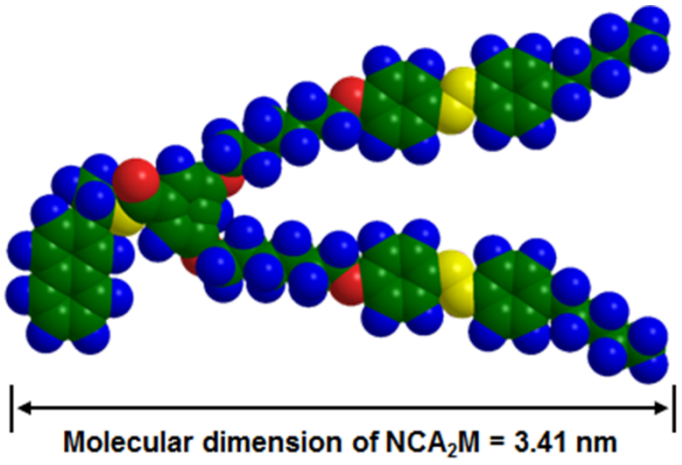

Fig. S10. Energy-minimized geometric dimensions of NCA_2M