

## *Supplementary Material*

# Elucidation of the photoluminescence mechanism and determination of configuration content of arabinose isomer solution by fluorescence analysis

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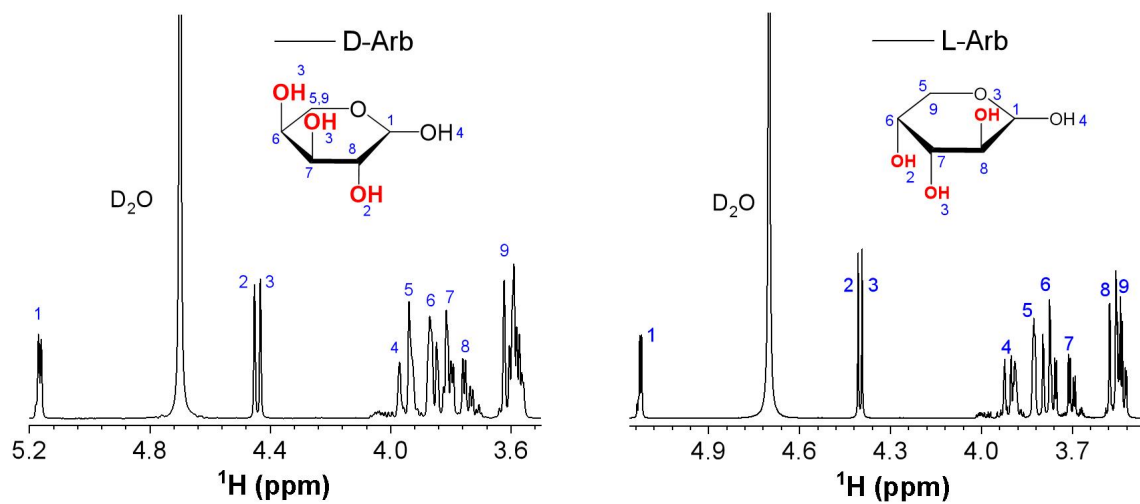
### **Methods**

**Materials.** D-(-)-Arabinos (D-Arb, 99%), L-(+)-Arabinos (L-Arb, 99%) and anhydrous ethanol (99.9%), which were purchased from Adamas-Beta Reagent Co. Purified water was purchased from Hangzhou Wahaha Group Co., Ltd and used as received.

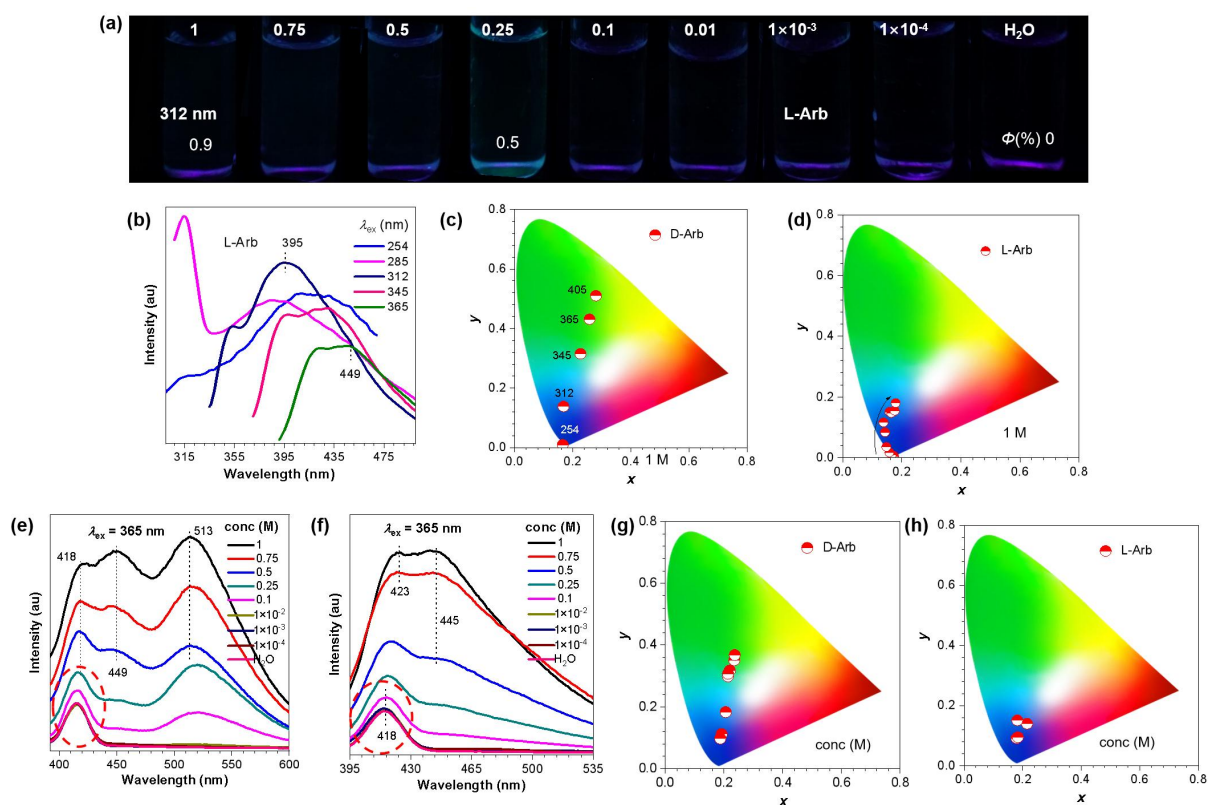
**Instrumentation.**  $^1\text{H}$  NMR spectra of SR dissolved in  $\text{D}_2\text{O}$  was recorded by using a Bruker Avance 400 MHz spectrometer (Bruker BioSpin GmbH, Rheinstetten, Germany). Absorption spectra of SR solution was taken on UV-8000, UV-Vis double-beam spectrophotometer (Shanghai Precision Instrument Co., Ltd, China). Absorption spectra of SR powder and tablet was taken on UV-2600, UV-Vis spectrometer (Shimadzu, Japan). The photoluminescence (PL) spectra of samples of the same quality were obtained with the fluorescence spectrophotometer (F-46001, Japan). Delayed PL spectra of solids at room temperature and phosphorescence lifetimes were measured on an Edinburgh FLS1000 fluorescence spectrometer. PL quantum yields (PLQY) of solids were measured on Horiba FluoroMax-4 spectrophotometer equipped with Quanta- $\phi$  F-3029 integrating sphere. XRD measurements were conducted on powders and tablets with a D8 Advance diffractometer (Bruker, Germany) and a Cu  $\text{K}\alpha$  radiation source ( $\lambda = 1.5418 \text{ \AA}$ ), at a scanning rate of  $6^\circ \text{ min}^{-1}$ . Luminescent photographs were taken with a SLR camera (Canon EOS 70D, Japan), and the videos were recorded using a camera (Sony A7S2, Japan) and the afterglow images were captured from the videos.

#### ***Calculation of HOMO, LUMO Electron Densities and Energy level***

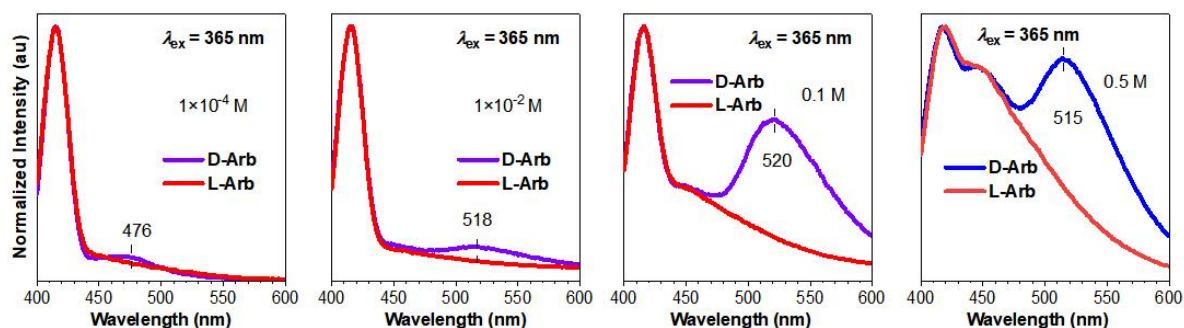
ORCA4.2 program was utilized to perform the TD-DFT calculations with this fundamentals and functionals (! B3LYP/G TZVP RIJCOSX miniprint tightSCF gridx6 NoFinalGridx CPCM(water)). The HOMO and LUMO energy densities were obtained via Multiwfn and VMD.



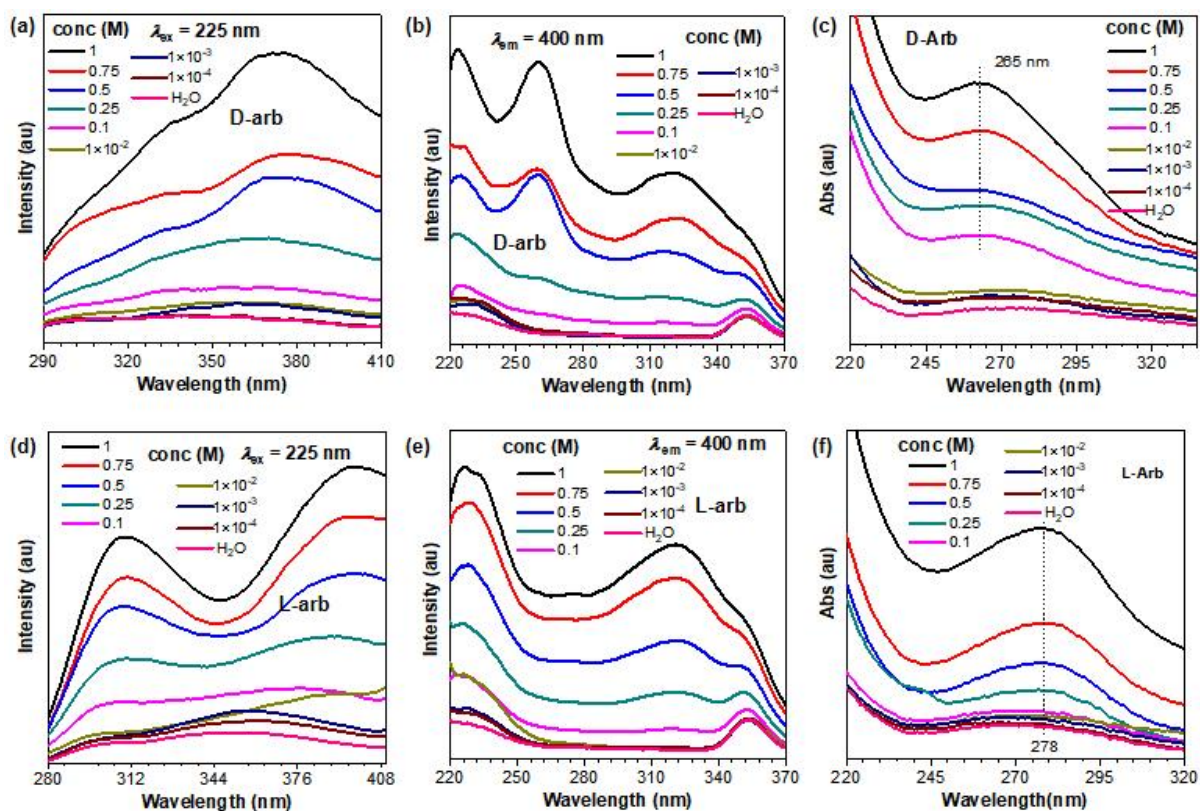
**Fig. S1**  $^1\text{H}$  NMR of D-Arb and L-Arb.



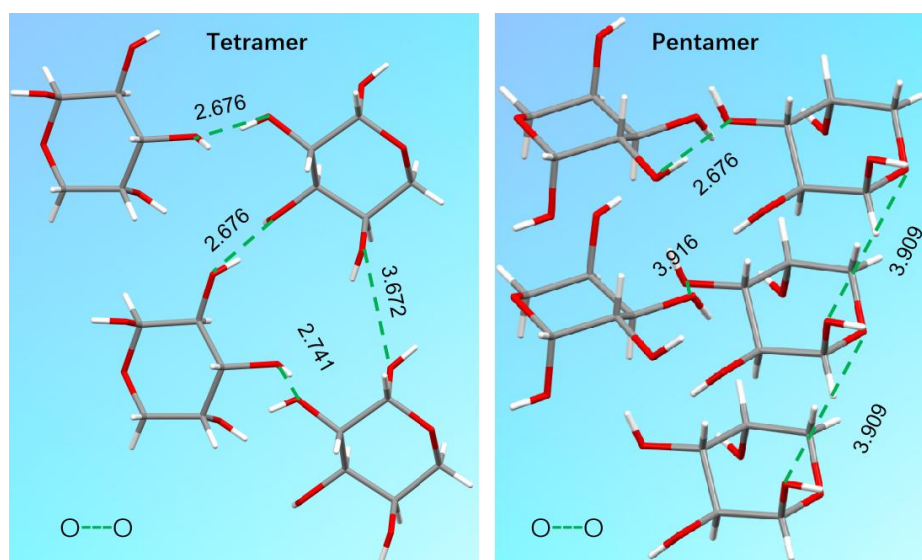
**Fig. S2** (a) Photographs of aqueous solutions of L-Arb at different concentrations taken under 312 nm UV light. (b) PL spectra of 1 M L-Arb aqueous solution at different  $\lambda_{ex}$ s. Trajectory of tunable PL colors of 1 M (c) D-Arb and (d) L-Arb aqueous solution, recorded by the change in the  $\lambda_{ex}$  from 254 to 365 nm, in the CIE coordinate diagram. PL spectra of different concentrations of (e) D-Arb and (f) L-Arb aqueous solution. Trajectory of tunable PL colors, recorded by the change in the  $\lambda_{ex}$  from 254 to 365 nm, in the CIE coordinate diagram of (g) D-Arb and (h) L-Arb aqueous solution ( $\lambda_{ex}=365$  nm).



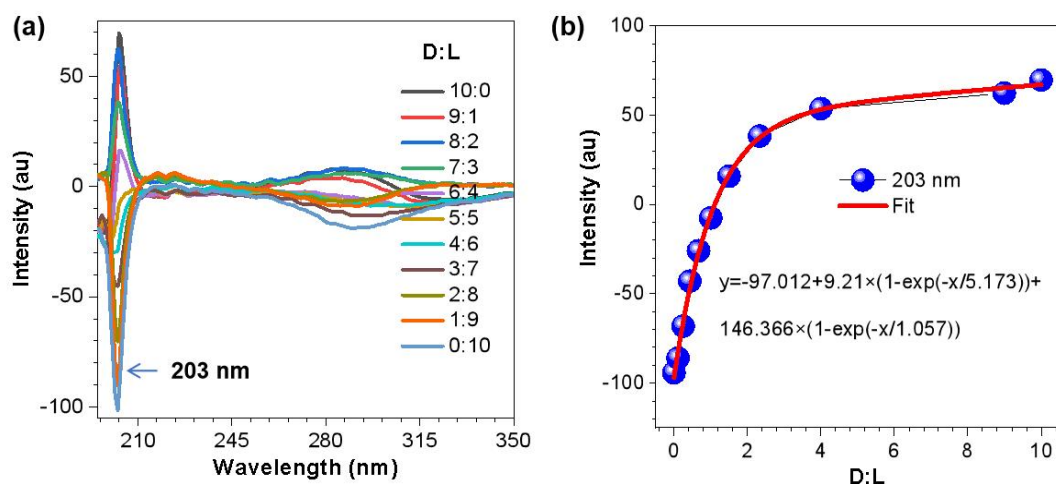
**Fig. S3** Normalized spectral comparison of D-Arb and L-Arb at different concentrations ( $\lambda_{ex} = 365$  nm).



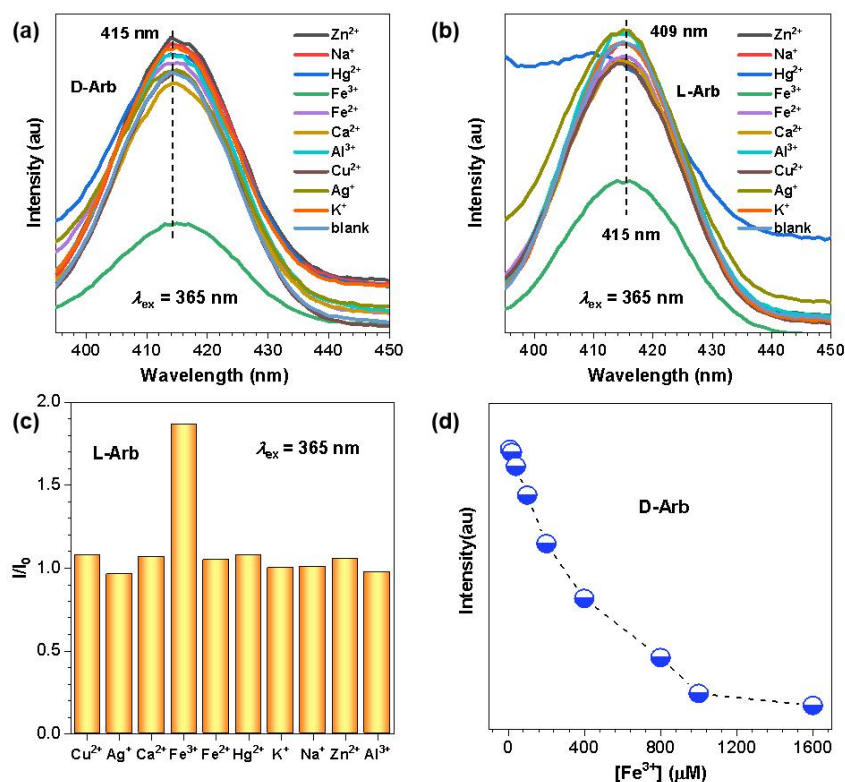
**Fig. S4** PL spectra of D-Arb and L-Arb at different concentrations ( $\lambda_{\text{ex}}=225$  nm, a,d) and ( $\lambda_{\text{ex}}=400$  nm, b,e). UV absorption spectra of D-Arb (c) and L-Arb (f) at different concentrations.



**Fig. S5** Molecular interactions in coupled triplets and tetramers of D-Arb.



**Fig. S6** (a) Circular dichroism spectra of mixed aqueous solutions of D-Arb and L-Arb with different molar ratios. (b) Fitting curves of the relationship between peak intensity at 203 nm and molar ratios of D-Arb and L-Arb aqueous solutions.



**Fig. S7** PL spectra of (a) D-Arb and (b) L-Arb (0.01 M) after adding different 1000  $\mu\text{M}$  metal ions (NaCl, KCl,  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ ,  $\text{FeSO}_4$ ,  $\text{ZnCl}_2$ ,  $\text{CuCl}_2$ ,  $\text{CaCl}_2$ ,  $\text{MnCl}_2$ ,  $\text{NiCl}_2$ ,  $\text{Ag}_2\text{SO}_4$ ,  $\text{HgSO}_4$ ) ( $\lambda_{\text{ex}}=365$  nm). (c) PL intensity changes of L-Arb (0.01 M) adding different 1000  $\mu\text{M}$

metal ions. (d) PL spectra of D-Arb solution (0.01 M) with multiple  $\text{Fe}^{3+}$  concentrations.