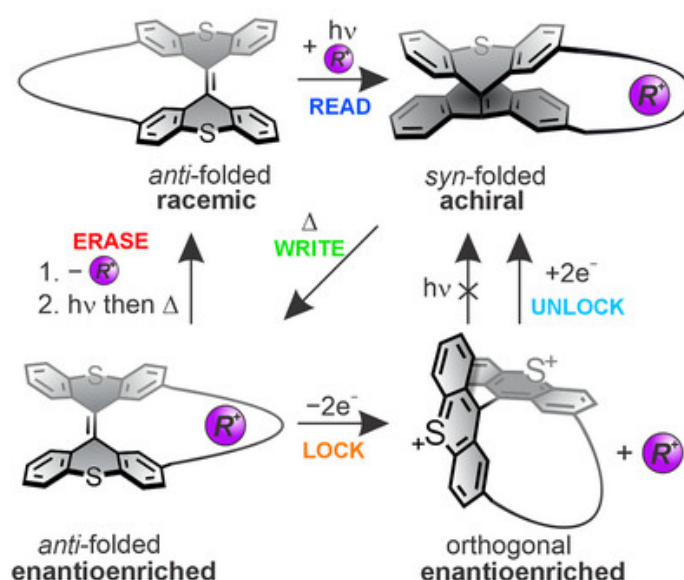


Chiral Induction and Memory via Light-Induced Supramolecular Deracemization

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The control of stereochemical elements is a central challenge in organic chemistry, with implications for a wide range of fields.^[1] Access to well-defined chiral states has been achieved through various desymmetrization strategies; however, systems with reconfigurable chirality, which are particularly attractive for applications in molecular memory, remain rare.^[2] Recently, we reported a dynamic molecular system that enables reversible switching between distinct chiral states, allowing external stimuli to be sensed, encoded, and read out as chiral memory. Our system is based on a photo- and redox-responsive molecular switch that can bind a chiral cation guest (information input). Upon binding of the guest, light irradiation of the racemic *anti*-folded state leads to the formation of the achiral *syn*-folded state (READ), which then relaxes back to an enantioenriched *anti*-folded state (WRITE).



The chiral memory function relies on a supramolecular deracemization strategy, where the relaxation from the *syn*-folded state to one of the diastereomeric *anti*-folded host-guest complexes is kinetically favored. Notably, the chiral memory herein does not fade when the bound guest is removed from the system, as the *anti*-folded state has a high racemization barrier. Moreover, oxidation of the enantiomerically enriched sample results in an enantioenriched dicationic orthogonal state, which does not interconvert upon light irradiation, thus allowing the chiral memory to be locked. This versatile molecular system thus enables storing information in absence of the chiral information input and features the possibility of locking, removing and reintroducing the memory information from and to the (device) circuit on demand.^[3]

[1] E. L. Eliel, S. H. Wilen, *Stereochemistry of Organic Compounds*, John Wiley & Sons, Nashville, **1994**.

[2] E. Yashima, K. Maeda, Y. Okamoto, *Nature* **1999**, *399*, 449–451.

[3] R. Hein[‡], E. Sidler[‡], Y. Gisbert, B. L. Feringa, *Angew. Chem. Int. Ed.* **2025**, *64*, e202510584.