Nearly perfect chirality inversion of a helical metallocryptand upon crystal dissolution assisted by guest binding as a booster stimulus

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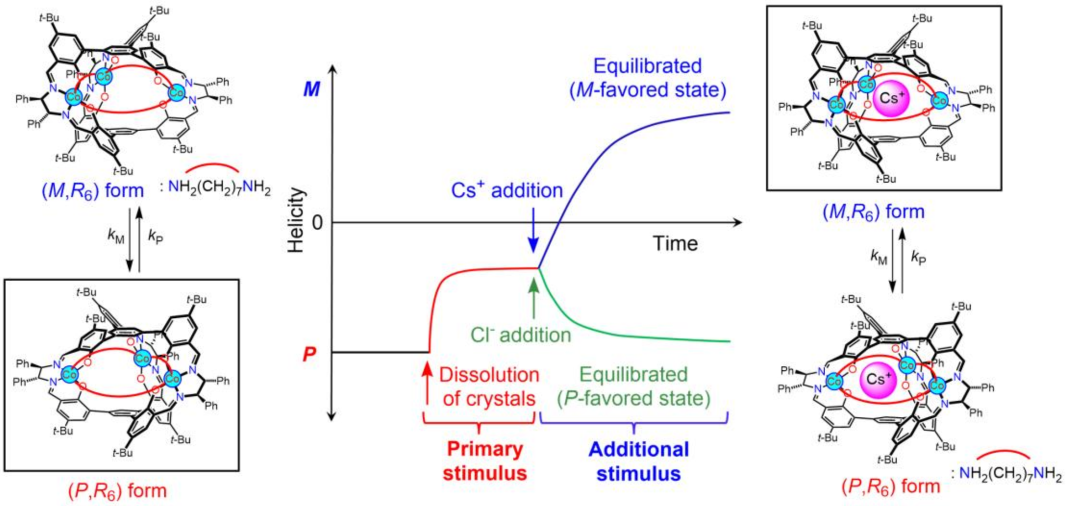
Development of artificial dynamic helical molecules with controllable helix inversion rate can be useful to make chiral memory materials.[1] In literature, chirality inversion has been mostly studied and discussed as equilibrated states both before and after inversion without focusing on equilibration kinetics.[1] We have already demonstrated that the helicity inversion kinetics of trinickel(II) cryptands can be controlled by guest recognition in the cryptand cavity.[2,3]

We have synthesized chiral tris(salen)-type tricobalt(III) metallocryptands with diamines at the aperure. In this work, we observed time dependent changes for nearly perfect chirality inversion of the helical tricobalt metallocryptand from pure P form in the crystalline state to M-major in solution, which is assisted by binding with a cation as a booster stimulus. The metallocryptand has both cation and anion binding sites; the cation binding in its closed binding cavity enabled the chirality inversion, while anion binding preserved the same chirality as that in the crystalline state.



Scheme 1. Helicity inversion control in a dynamic tricobalt(III) cryptand by two step stimulus.

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