Novel chiral pentadentate ligands with naphthyridine and camphorsulfonyl groups have been designed and used to control the chirality of quadruple helixes of metal strings directly: Δ-Ni5((-)-camnpda)4 (1) and Λ-Ni5((+)-camnpda)4 (2). Compound 1 is a Δ form metal string complex with H2((-)-camnpda) and 2 is Λ form one with H2((+)-camnpda). By X-ray single-crystal diffraction, the structures of the compound 1 and 2 are both 2,2-trans form in the same monoclinic space group C2 and have the similar unit cell. Further, it demonstrates that two metal strings are chiral isomers each other by CD spectra. In theoretical computation, the local minimum (Λ-Ni5((+)-camnpda)4 with the Δ form) becomes energetically unfavourable by about 100 kcal/mol due to the strong steric repulsion introduced by the camphor groups. Finally, the racemic crystal is obtained with a 1:1 mixture of compounds 1 and 2 in triclinic space group P-1. Both the external dinickel distance in 1 and 2, about 2.280 Å, and the SQUID experiment reveal mixed valence [Ni2]3+ characters and the magnetic behaviors are anti-ferromagnetic (J = -55.0 cm⁻¹ for 1 and -63.3 cm⁻¹ for 2). In the electrochemistry, the three reversible oxidation waves in 1 and 2 are -0.13, 0.20 and 0.97 V.


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