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Self-Selecting Homochiral Quadruple-Stranded Helicates and Mesocates

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A series of quadruple-stranded Cu₄L₄ cages have been synthesised using ligands containing a biphenylsulfonediimide core substituted with two amino acid groups. Analogous chiral complexes (helicates) and achiral complexes (mesocates) can be formed by controlling or removing the stereocentres within the ligands. Helicates, complexes which have supramolecular chirality generated by a helical sense within the complex, are formed using leucine-substituted ligands. These quadruple stranded Cu₄L₄ helicates contain copper paddlewheels at either end with the four ligands twisting between the Cu₂ units. Changing the isomer of the amino acid changes the handedness of the helicate, with L-leucine forming the Λ helicate and the D-leucine forming the Δ helicate. The helicate cages are also shown to be self-selecting, as the reaction of a mixture of L-leucine and D-leucine substituted ligands forms the Δ and Λ cages with no product containing both ligands. The chirality of the helicates can be disrupted by two different methods, to form a mesocate which lacks helical chirality. When the achiral glycine-derived ligand is used a quadruple stranded mesocate is formed (analogous to the chiral Cu₄L₄ cages) in which the ligands run straight 'up-and-down' the complex rather than in a helical manner. When a racemic DL-leucine-substituted ligand is used a similar mesocate is formed.

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