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Enantimeric Separation Using Entangled Coordination Polymers

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Chiral coordination polymers, using ligands that contain large aromatic cores have been used to synthesize a series of polycatenanes and a polyrotaxane, by virtue of interactions involving metal-lomacrocyclic motifs, including interpenetrated networks that have been used as stationary phases to obtain excellent enantiomeric resolution in liquid-chromatographic separations.

A series of dicarboxylate ligands, in which amino acids are appended to naphthalene- or perylene-diimides, have been used to readily impart chirality into coordination polymers. A repeating structural motif, in which dinuclear metal clusters are bridged by two ligands to form a metallomacrocyclic with a separation of ca. 7 Å between opposing aromatic faces –an ideal distance for hosting an aromatic guest. This motif has been exploited to form polycatenanes, through self-complementary association of the metallomacrocycles, and a 1D→3D polyrotaxane when using a 4,4'-bipyridyl co-ligand as a linear thread.

Two 2D→3D interpenetrated materials have been shown to act as efficient stationary phases for enantioselective separations in small-scale testing with 1-phenylethanol, pantolactone and limonene. The separation activity of the material is much greater than that of the free ligand alone.

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