We will present new strategies to generate optically pure compounds with unprecedented, α-helix-like complexity via iron-templated self-assembly.

Protein α-helices I are employed in binding events with proteins, nucleic acids and membranes. They are a major component of most host-defence peptides\(^3\) and mediate key protein handshakes in cancer.\(^3\) As therapeutic agents, however, they tend to rapidly degrade leading to poor pharmacokinetics and so synthetic mimics are being developed which include more favourable properties.\(^4\)

The metal-templated triple bimetallic helicates II are of a similar size and charge to α-helices and some bind to biomolecules,\(^5\) but they rarely contain functional groups and have much higher symmetry \((C_9)\).

Overall, the chemistry is currently not sophisticated enough to deliver molecules that fulfil the criteria which would allow them to be considered as practical α-helix mimics in biomedical chemistry.\(^6\)

We recently developed a series of optically and diastereochimically pure monometallic complexes \([M(AB)_3]^{2+}\)\(^,\)\(^7\)\(^,\)\(^8\) and this project tethers these with various linkers to create water stable, optically pure structures \([M_2(AB'-B'A)_3]\)\(^4\) which we call flexicates by analogy with the related helicates. They have potential in the biological regime as antimicrobial\(^9\) and anticancer agents, with selectivity and activity determined by the exact functionality of the organic ligand. Initial IC\(_{50}\) values have shown that flexicates have a similar activity to Cisplatin with a significantly better selectivity profile and we will report many new functional complexes.

Current synthetic approaches to self-assembly invariably lead to either symmetrical complexes (as II) or more commonly mixtures. Most excitingly we have devised functional unsymmetrical flexicates III using carefully designed directional ligands AB→CD. This new approach has allowed us to take hitherto unfeasible steps towards α-helix-like complexity in a readily-assembled large molecule, and thus make major progress in the development of very novel drug candidates.

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