

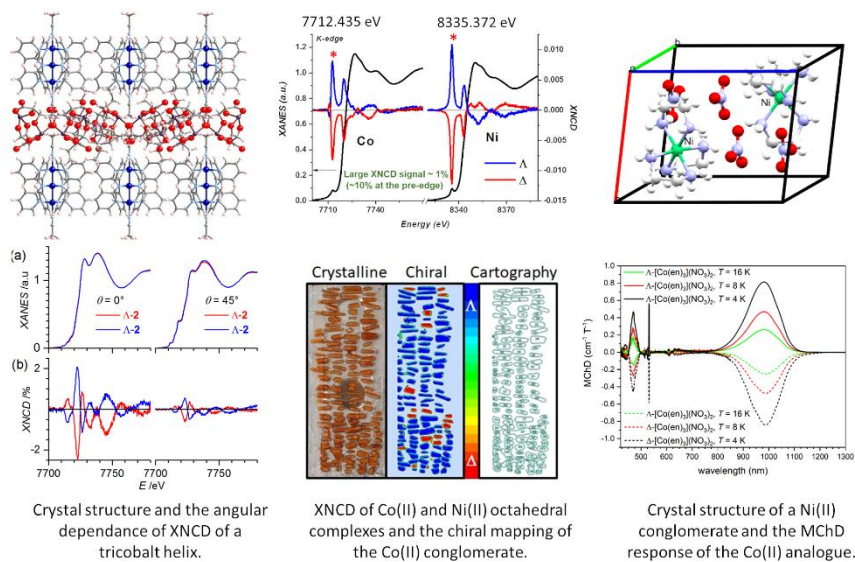
# Contributions of coordination chemistry to chiroptical spectroscopies

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Chiral molecules are fascinating substances, giving rise to rich manifestations of the light-matter interaction and being central to questions about the origin of terrestrial life. As is well known, enantiomers possess identical physical properties, except when interacting with another chiral source, such as circularly polarized light. For this reason, an array of spectroscopic techniques, such as electronic and vibrational circular dichroism and circularly polarized luminescence, have become routine methods of unveiling chiroptical responses important to chemistry and biology.

This lecture will present our recent work with some lesser-known chiroptical phenomena – X-ray Natural Circular Dichroism (XNCD), Raman Optical Activity (ROA), and Magnetochiral Dichroism (MChD) – which sheds light on the mechanisms behind the interaction between light and chiral molecules. To observe these exotic signals, we exploit the versatility of coordination chemistry to produce helicoidal model compounds with different three-dimensional shapes and electronic structures. Focusing on 3d transition metal complexes, we have obtained enantiopure materials by resolution of racemic mixtures using diastereometric and conglomerate crystallization, as well as self-assembly on chiral nano-platforms. These materials, which have been studied in solution, in the solid state and as thin films, present intense chiroptical anisotropy for vibrational, electronic and core-shell transitions, as well as unexpected chirality induction in achiral molecules.



The presentation will address the synthesis of the chiral materials, emphasizing 1) the chiroptical properties of polynuclear helices<sup>[1,2]</sup> and their propensity for chirality induction, 2) XNCD as a new tool for chirality mapping of single crystals,<sup>[3]</sup> 3) the key importance of vibronic coupling in the MChD response<sup>[4]</sup> and 4) the induction of chirality in porphyrin compounds self-assembled on silica nano-helices.

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