

# Manipulating and understanding the solution structure of lanthanoid coordination compounds

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## Abstract:

As a consequence of their unique electronic structure, the lanthanoids are a special group of elements with outstanding photophysical and magnetic properties. These have already been exploited for various high-tech applications, for example in displays, in bio-assays or as contrast agents for MRI. From a chemical perspective, the special electronic structure leads to very similar chemical properties across the series and has a drastical influence on the coordination behaviour of the lanthanoids. Unlike for the transition metals, ligand field effects are small and hence the interaction between lanthanoid and ligand is mostly electrostatic and undirectional. In solution, most lanthanoid coordination compounds are present as mixtures of interconverting isomers. With the argument that due to the small ligand field effects the photophysical properties are invariant towards relatively small changes of the structure, there used to be only limited efforts to reliably understand and correlate the solution state structure of photophysically active lanthanoid complexes. While this is a reasonable simplification in the scope of classical photophysical properties, it becomes a substantial limitation in the study of more sophisticated phenomena such as circularly polarised luminescence (CPL). In our group we are working on the realisation of new strategies for the manipulation of the solution state structure of lanthanoid coordination compounds. This will allow for an in situ manipulation of certain lanthanoid centered properties, potential applications are for example in the development of smart contrast agents for MRI or new dyes for STED imaging. Connected to that are our efforts to establish reliable strategies for the structural elucidation of lanthanoid complexes and the analysis of their isomeric mixtures. One promising approach to that is the direct excitation of lanthanoids with the aid of lasers.

## Short CV:

After studying chemistry at the Ruhr-University Bochum, Elisabeth Kreidt moved to the University of Tübingen and completed her PhD on luminescent lanthanoid cryptates in 2018. As a postdoc, she then joined the group of Prof. Dave Leigh at University of Manchester, where she worked on molecular knots and molecular machinery. In March 2022 she started her independent group at the TU Dortmund University.