

Monitoring of Molecular Interactions by Optical Spectroscopies

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Chiral ruthenium complexes with chelating ligands received attention due to their ability to bind to specific DNA sequences.

We have synthesized simple model chiral enantiomeric complexes Δ -[Ru(bpy)₂phen](PF₆)₂ and Λ -[Ru(bpy)₂phen](PF₆)₂, and characterized the products using ECD (electronic circular dichroism), VCD (vibrational circular dichroism), IR (infrared), UV-VIS (ultraviolet-visible) absorption spectroscopy. We interpreted the measured spectra on the basis of the theoretical ones obtained by quantum chemical calculations.

We also investigated interactions of the synthesized ruthenium complexes with different derivatives of guanine. The ECD spectra of a mixture of the ruthenium complex with guanine derivatives exhibited concentration dependent spectral changes. These changes were attributed to association of cationic complexes with anionic guanine derivatives. The changes in spectra were gradual, and we were not able to isolate spectra of individual chemical species, whose linear combination would yield the observed signal. Instead, these changes seemed to be caused by a gradual change in electronic structure of the complexes caused by the guanine derivatives.

The different rates of change for different derivatives are also discussed in terms of electronic structure of the derivatives. Interpretation of the spectra suggests that the charge distribution plays major role in the interaction between the complex and guanine derivatives molecules.