Ruthenium complexes with 2-(2'-pyridyl)benzimidazole. Correlation between spectroscopic data and crystal structure

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Introduction

The chemistry of ruthenium complexes is currently receiving a lot of attention, primarily because of their applications in medicine and industry. The distinguishing feature of ruthenium compounds is their wealth of oxidation states from -2 to +8. Ru(II) and Ru(III) complexes possess antitumor activity [1, 2]. Additionally, they can be used as metalorganic drugs of many infectious diseases caused by parasites, bacteria and fungi [3, 4]. In contrast, Ru(II) and Ru(IV) compounds have a wide range of applications in organic synthesis and polymer chemistry. Those complexes are used in classical catalytic processes such as olefin metathesis, hydrogenation, isomerisation, reductive elimination [5, 6].

Molecular and crystal structure

The IR and UV-Vis spectra of the complexes were recorded. The cyclic voltammograms of complexes 2 show three one-electron redox processes. The first redox couple is reversible, whereas the other two couples have a quasi-reversible nature.

Electrochemical studies

The reactions of a mother solution of RuCl₃ with 2-(2'-pyridyl)benzimidazole (2,2'PyBIm, L) yielded two ruthenium complexes:

\[(H₂L)₂[RuCl₂(CH₂CN)]₂[RuCl₂(CH₂CN)]₂Cl₂·6H₂O (1),\]

\[mer-[RuCl₂L₂(CH₂CN)] L·3H₂O (2)\]

Conclusions

The exchange of one electron in the redox pair Ru(III)/Ru(II) occurred reversibly. The quasi-reversible character of the electrode reaction is characteristic of the couples Ru(II)/Ru(III) and Ru(IV)/Ru(III).

The obtained results show that complex is supposed to be a catalytic active, because has oxidation-reduction properties.

References


In the obtained complexes, ruthenium ions experience an distorted octahedral environment.