The isomeric-dependent optical properties of aqueous solutions of platinum-containing drugs

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Platinum drugs have been used in many fields of biology and medicine for a long time. Although the platinum salt of PtCl2(NH3)2 exists in two isomeric configurations, the main studies were performed for the cis-form, because it is well known that the cis-form of the platinum salt (cisplatin) can intercalate inside DNA by attaching to neighboring bases, and this property used in anti-cancer drugs.

However, recently scientists have paid attention to the trans-form of the platinum salt – transplatin as a new drug for treatment. It has less reactivity, but also interacts with DNA. Due to the shape of the molecule, it does not cling to neighboring DNA bases, but mainly connects to the bases from different strands.

The optical properties (optical absorption, fluorescence and fluorescence excitation) of aqueous solutions of cis- and trans- forms of platinum salt $PtCl_2(NH_3)_2$ were investigated. It is shown that the absorption spectra of the two substances are similar, but trans-platinum, compared with cisplatin, have more sharp shape of the peaks. The fluorescence and excitation spectra at 300 K of both isomers are very similar. Difference in the spectra observed in the absorption was not manifested in the excitation spectra. This fact needs further research and clarification.

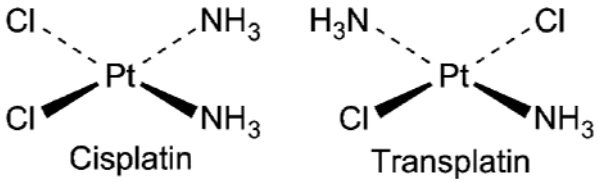
Samples preparation:

Al samples in powder form pursaged from Sigma Aldrih and used without further purification. Samples were dissolved in pure distilled water (water for injections in medical form were used)

Methods: Optical absorbtion in UV and visible spectral range were measured using UV-1900 spectrophotometer.

Fluorescence and excitation of the fluorescence were obtained on Varian Cary Eclipse spectrofluorometer at 300K.

Standard quartz cuvettes (optical path length 10mm) were used.



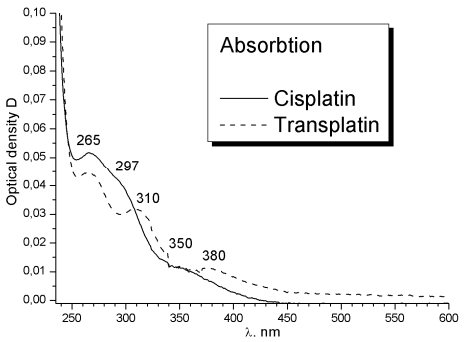
Cis- and trans- isomers of platinum drug PtCl2(NH3)2

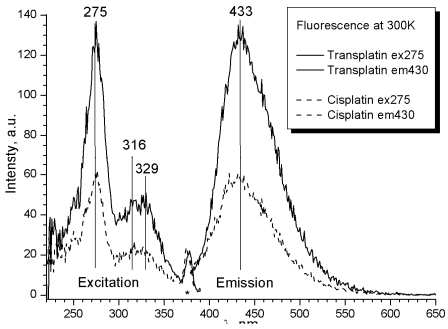
Comparison of wavelength (in nm) of peaks, observed in absorbtion and fluorescence

	Cisplatin	Transplatin
Absorbtion	265, 297, 350	365, 310, 360
Fluorescence	432	433
Fluorescence excitation	375, 316, 329	375, 316, 329

The absorbtion spectra of both samples are very close, the absorbtion ratio is also similar. The structure in absorbtion of transplatin can be seen, also some small red-shift of transplatin absorbtion bands is observed.

The fluorescence spectra and it excitation were very similar in shape, the only difference is intensity – the fluorescence intensity of transplatin twice more than in cisplatin. This fact is clearly observed, because molar concentrations of samples were the same.





Conclusions:

1. The difference in the isomeric structure of molecules is manifested in the optical absorption: the spectrum of the trans- isomer is more structured.
2. The difference in the isomeric structure of the molecules was not detected in the spectra of fluorescence and excitation.
3. Fluorescence of an aqueous solution of transplatin is twice as intensity of the fluorescence of cisplatin. This may be due to the higher symmetry of the transplatin molecule.