X-ray Examination of the Complex Adenosine, Guanosine and Cytidine with UO\textsubscript{2}\textsuperscript{2+} Ions

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\textbf{Abstract:} Interaction of dioxouranium (VI) UO\textsubscript{2}\textsuperscript{2+} ion with Adenosine-5'-triphosphate, Guanosine-5'-triphosphate and Cytidine-5'-triphosphate were obtained a complex of Adenosine, Guanosine and Cytidine with uranium UO\textsubscript{2}\textsuperscript{2+} ions and X-ray method to explore these complexes.

\textbf{Key words:} DNA, uranyl ion, X-ray, Adenosine, Guanosine, Cytidine complexes.

1. Introduction

Metal complex formation of nucleotides is well documented, as well as its biological importance. Metal-nucleotide complex may act as cofactor, substrate or modifier in promoting enzymatic catalysis of displacement reactions of phosphorus and maintaining structural integrity and specificity of nucleic acids. Nucleotides bing metal through three potential binding sites: phosphate groups, sugar hydroxyl groups and ring nitrogen of base [1-13].

The purpose of this work is to obtain a complex of adenosine with uranium UO\textsubscript{2}\textsuperscript{2+} and thorium Th\textsuperscript{4+} ions and X-ray method to explore these complexes.

2. Experimental Sections

Dioxouranium (VI) (UO\textsubscript{2}\textsuperscript{2+}) and thorium (Th\textsuperscript{4+}) cations was used as nitrate salts. ATP (5'-adenosine 5'-triphosphate), ADP (5'-adenosine 5'-diphosphate), AMP (5'-adenosine 5'-monophosphate), CTP (5'-cytidine triphosphate), CDP (5'-cytidine diphosphate), CMP (5'-cytidine monophosphate), GDP (5'-guanosine diphosphate), was used as disodium salt.

3. Results and Discussion

In Ref. [1] has been studied interaction of dioxouranium (VI) (uranyl) ion with ATP was studied by ligand/proton and metal/hydroxide displacement technique, at very low ionic strength and at I = 0.15 mol·L\textsuperscript{-1}, in aqueous Me\textsubscript{4}NCl and NaCl solutions, at t = 25 °C.

The interaction of adenosine with uranyl ions is described by the Eq. (1):

\[ p\text{UO}_2^{2+} + q(\text{ATP}^4-) + r\text{H}^+ \rightarrow (\text{UO}_2)^p(\text{ATP})_q\text{H}_r^{(2p - 4q + r)} \] (1)

Analysis of the complex of adenosine with uranium UO\textsubscript{2}\textsuperscript{2+} and thorium Th\textsuperscript{4+} ions was performed by X-ray microanalysis. Instrument: electron probe microanalyzer. Brand: Superprobe 733, Japan Electron Optics Laboratories, Japan.

The analysis of the elemental composition of the resulting of the microsphere magnetic catalyst with salts of Thorium and of Uranium was performed using energy-dispersive spectrometer Energy Oxford Instruments, England, established by electron probe microanalyzer Superprobe 733 at an accelerating voltage of 25 kV and a probe current of 25 nA.

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Fig. 1  Obtained a complex of A, G, C with UO$_2^{2+}$.

Figs. 1 and 2 show the laboratory unit and X-ray spectrum of the complex Adenosine with UO$_2^{2+}$ and Th$^{4+}$.

Table 1 shows the elemental composition of the complex Adenosine with uranium (UO$_2^{2+}$) and thorium (Th$^{4+}$) ions.

Thus, the authors obtained a complex of adenosine with uranium UO$_2^{2+}$ and thorium Th$^{4+}$ ions and X-ray method to explore these complexes.

Fig. 3 shows the IR (infrared spectroscopy) spectra of the complexes Adenosine, Guanosine and Cytidine with UO$_2^{2+}$ ions.
Table 1  Elemental composition of the complex Adenosine with UO$_2^{2+}$ and Th$^{4+}$ ions.

<table>
<thead>
<tr>
<th>Element</th>
<th>P</th>
<th>Na</th>
<th>Th</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit %</td>
<td>3.556</td>
<td>9.055</td>
<td>0.100</td>
<td>84.421</td>
</tr>
</tbody>
</table>

(a)

(b)
X-ray Examination of the Complex Adenosine, Guanosine and Cytidine with $\text{UO}_2^{2+}$ Ions

(c) $\text{ATP + UO}_2^{2+}$

(d) $\text{CMP + UO}_2^{2+}$
X-ray Examination of the Complex Adenosine, Guanosine and Cytidine with UO$_2$$^{2+}$ Ions

(c) CDP + UO$_2$$^{2+}$

(f) CTP + UO$_2$$^{2+}$
Thus, the authors obtained a complex of ATP, ADP, AMP, CTP, CDP, CMP, GDP with uranium UO$_2^{2+}$ ions and IR spectra and X-ray method to explore these complexes.

4. Conclusions

Interaction of dioxouraniun (VI) UO$_2^{2+}$ ions with ATP, ADP, AMP, CTP, CDP, CMP, GDP was obtained a complex of adenosine with uranium UO$_2^{2+}$ ions and X-ray method to explore these complexes.

Acknowledgments

The authors would like to thank Lynn C. Francesconi (Hunter College CUNY), Ruben M. Savizky (Columbia University, New York), Peter C. Burns (Notre Dame University, Indiana) and Chistopher L. Cahill (George Washington University) for discussion of the results.

References

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