

STUDIES OF COMPOUNDS PREPARED
DIRECTLY FROM THE PERTECHNETATE ION

by

MICHAEL JEFFREY ABRAMS

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ABSTRACT

Chapter 1

Novel complexes of heptavalent technetium with the formulation TcO_3XL ($L = 2,2'$ -bipyridine, $X = Cl, Br$; $L = 1,10$ -phenanthroline, $X = Cl$) have been prepared and characterized by elemental analysis and optical and vibrational spectroscopy. These complexes can be reduced to the pentavalent species, $TcOX_3L$, by heating in ethanolic aqueous HX . $TcOX_3(2,2'$ -bipyridine) ($X = Cl, Br$) can be synthesized independently from $n-Bu_4N[TcOX_4]$ and $2,2'$ -bipyridine in ethanolic aqueous HX .

Chapter 2

The preparation and characterization of hexakis(S-thiourea) technetium(III) trichloride tetrahydrate, A, is described. Crystals of A are monoclinic $C2/c$, with $a = 11.876(2)\text{\AA}$, $b = 12.078(2)\text{\AA}$, $c = 19.662(3)\text{\AA}$, $\beta = 95.32(1)^\circ$ and have four formula in the unit cell. The structure was determined by standard methods and refined to $R_1 = 0.0391$, $R_2 = 0.0452$ based on 1753 independent reflections. Data were measured with use of $MoK\alpha$ radiation and a Syntex $P2_1$ diffractometer. The cation is roughly octahedrally coordinated by the six sulfur atoms of the thiourea groups. The reactions of the cation with various ligands and the reactions of pertechnetate with the substituted thioureas (N,N'-dimethylthiourea and N,N,N',N'-tetramethylthiourea) are also described.

Chapter 3

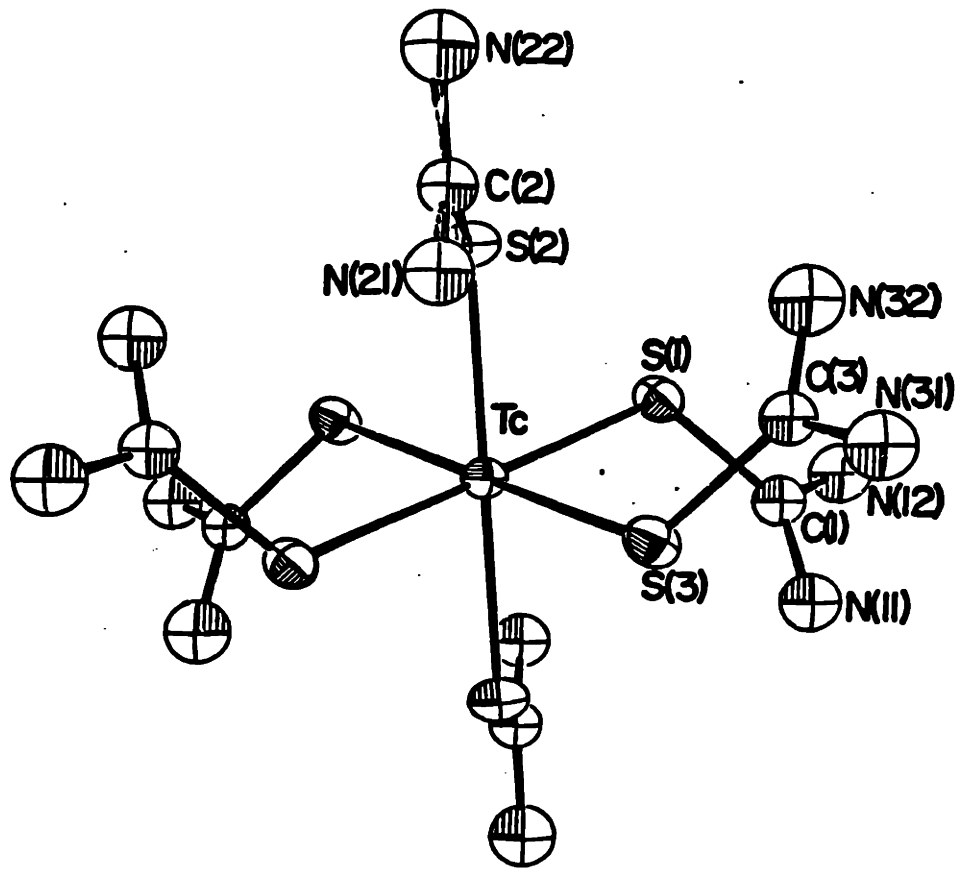
The complexes $[Tc(CNR)_6]PF_6$ (where $R = \text{tert-butyl, methyl, cyclohexyl and phenyl}$) have been prepared by reduction of the pertechnetate ion with aqueous sodium dithionite in the presence of the isocyanide ligands. These complexes have been characterized by elemental analysis, optical, infra-red

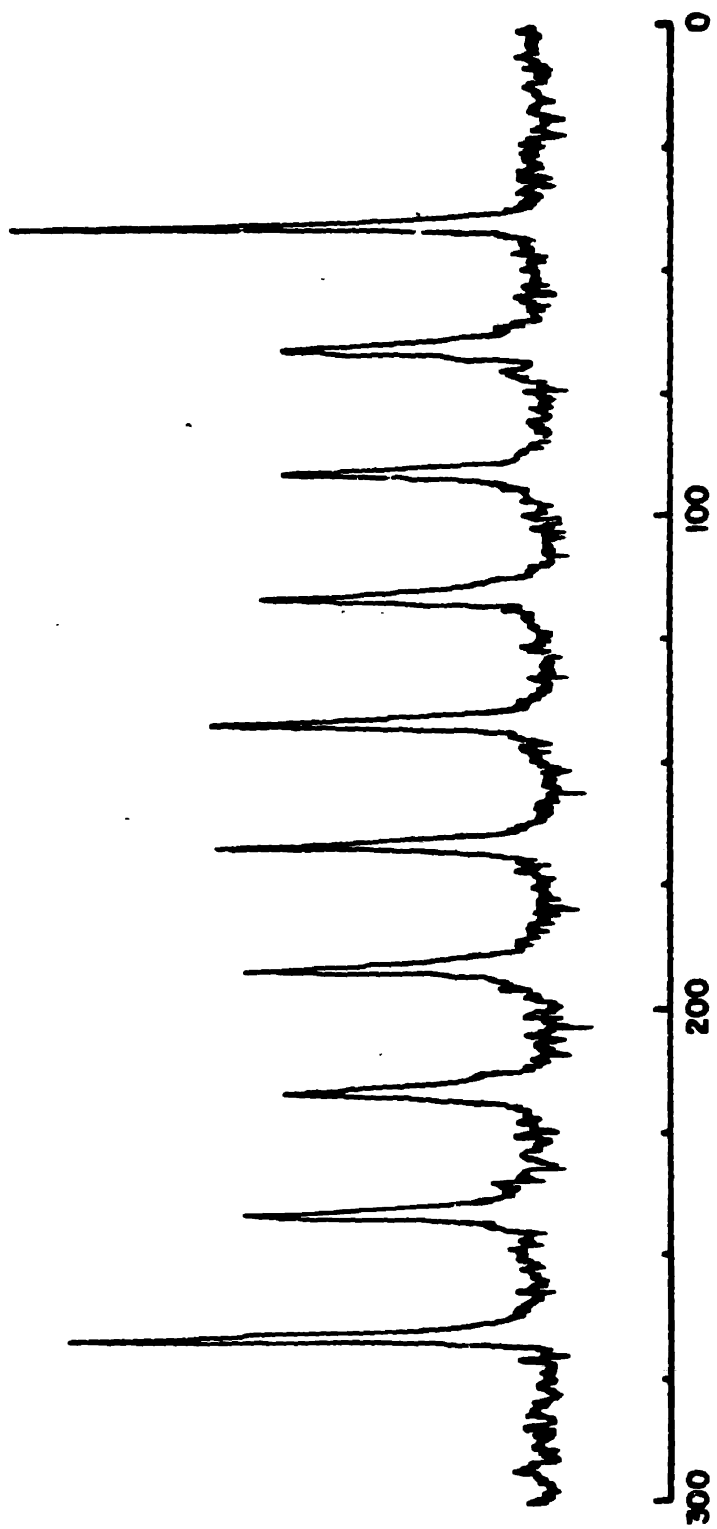
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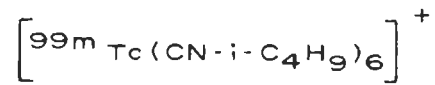
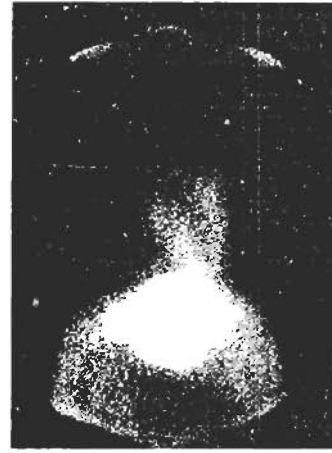
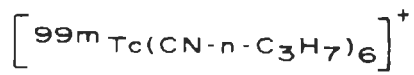
The widespread use of the metastable isotope of technetium (^{99m}Tc) in diagnostic nuclear medicine procedures is well documented.^{1,2} This, in part, is due to the favorable nuclear properties of the isotope ($\gamma = 140 \text{ keV}$, $t_{1/2} = 6\text{h}$) which allow gamma camera images of high resolution to be obtained with a low-radiation dose to the patient. Also, the advent of the ^{99m}Tc generator has made the isotope inexpensive and readily available. Since the chemical form of technetium obtained from the generator is the pertechnetate ion, ($[\text{TcO}_4^-]$), all radiopharmaceuticals containing ^{99m}Tc must be prepared from that Tc(VII) precursor. The studies described in this thesis were carried out to gain a better understanding of what kinds of coordination complexes can be prepared directly from $[\text{TcO}_4]^-$ with the hope that such information might lead to the development of new radiopharmaceutical agents and/or to a better understanding of agents already in clinical use.

References

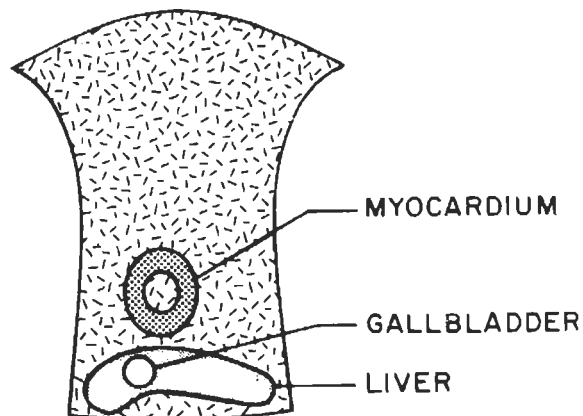
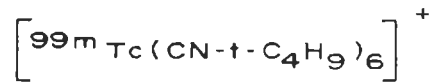
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2. Subramanian, G.; Rhodes, B. A.; Cooper, J. F.; Sodd, V. J.; eds., "Radiopharmaceuticals," The Society of Nuclear Medicine: New York, 1975.



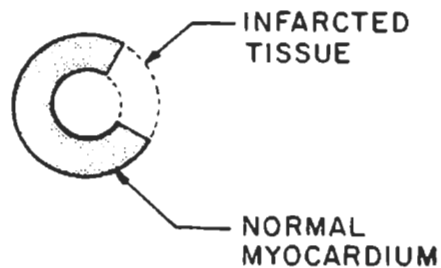




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SCHEMATIC REPRESENTATION OF ANATOMICAL FEATURES OBSERVED
WHEN IMAGING RIB-CAGE AREA OF A DOG



SCHEMATIC REPRESENTATION OF A TOMOGRAPHIC SLICE OF AN INFARCTED DOG HEART

