1. Introduction

In recent years there has been considerable interest in the collective properties of spherical even nuclei. The nuclei of osmium and platinum form a critical test of nuclear models. From this point of view, platinum nuclei are very interesting.

The nuclei of osmium and platinum form part of a transition region in which the shape of the nuclear surface turns from spherical to deformed. Part of a transition region in which the shape of the nuclear surface turns from spherical to deformed.

The decay of $^{192}$Ir and $^{194}$Ir have been extensively studied. However, more information about the $2^+ \rightarrow 2^+$ transitions in $^{192}$Pt and $^{194}$Pt are necessary.

The experiments described below were undertaken in order to furnish more data on transitions in such important nuclei. In the present work the absolute K-conversion coefficients of the $296$ and $293$ keV transitions in $^{192}$Pt and $^{194}$Pt, respectively, were measured.

2. Experimental Procedure

2.1. Source Preparation

For the radioactive sources, $^{192}$Ir was prepared by thermal neutron irradiation of 98.7% pure $^{193}$Ir in a flux of $10^{13}$ neutrons/cm$^2$sec for about 6 hours. While $^{193}$Ir was prepared by thermal neutron irradiation of metallic iridium for about 2 weeks. Two months after the irradiation, the irradiated iridium was chemically treated as follows: the metallic iridium was heated for one hour with a small amount of sodium chloride in the presence of chlorine gas. Iridium thus treated was dissolved in water, then converted into $\text{H}_2\text{SO}_4$ solution.

2.2. Conversion Electron Spectra

The internal conversion spectra were measured by means of a high resolution iron-free double focusing beta-ray spectrometer ($q_0 = 50$ cm). With this instrument relative momentum measurements could be made.
with an accuracy of a few parts in $10^5$. The spectrometer was set so as to get a resolution of about 0.15%. An example of a conversion line taken is shown in Fig. 2. The investigation of the $2^+ \rightarrow 2^+$ transition requires measurements of the K-internal conversion electron intensity with respect to the intensity of the K-conversion line of pure E2 transition in the same isotope. In the present work the conversion intensities of 293:328 keV transitions in $^{192}$Pt and of 296:316 keV transitions in $^{192}$Pt were measured.

2.3. Gammay-ray Spectra

In order to obtain precise values of gamma-ray intensities, a Ge(Li) detector was employed whose intrinsic volume was approximately 0.7 cm x 3 cm$^2$. The resolution obtained was about 4 keV for the 510 keV annihilation gamma rays of $^{22}$Na. The efficiency of the Ge(Li) detector was calibrated by using several standard sources. Gamma-ray spectra of the transitions in $^{192}$Pt and $^{194}$Pt are shown in Figs. 3 and 4.

3. Experimental Results and Discussion

The multipolarities of the 296 and 293 keV transitions in $^{192}$Pt and $^{194}$Pt respectively, were determined from the comparison of absolute K-conversion coefficients with the theoretical ones. The conversion coefficients were calculated from the photon intensities and conversion electron data. Normalization between the two series of data is obtained by assuming that the 316 and 328 keV transitions are pure E2 transitions, in $^{192}$Pt and $^{194}$Pt respectively. For example:

$$a_K^{(296)} = \frac{e^{(296)}}{e^{(316)}} \times \frac{\gamma^{(316)}}{\gamma^{(296)}} \times a_K^{(316)}.$$ 

The K-conversion coefficients of the 316 and 328 keV E2 pure transitions in $^{192}$Pt and $^{194}$Pt have been taken from the theoretical values calculated by SLIV and BAND.

The relative gamma-ray intensities are found from our measurements as follows,

$$\gamma^{(293)}/\gamma^{(328)} = 0.185 \pm 0.010$$

and

$$\gamma^{(296)}/\gamma^{(316)} = 0.38 \pm 0.02$$

which are compatible with previous results.

The absolute K-conversion coefficients obtained are:

$$a_K^{(293)} = 0.0693 \pm 0.0055$$

and

$$a_K^{(296)} = 0.0688 \pm 0.0048.$$ 

The mixing ratio $\delta = E2/M1$ has been calculated from the conversion coefficients data as,

$$\delta^2 = \frac{a_K^{(M1)} - a_K^{(exp)}}{a_K^{(exp)} - a_K^{(E2)}}.$$ 

The mixing ratio $\delta$ for the $2^+ \rightarrow 2^+$ (296 keV) transition was found to be $6.0 \pm 0.5$.

Recently the $E0$ component was determined by MARINKOV et al.\(^7\) who measured the internal conversion ratio $K/L_{\text{int}}$ for the 296 keV transition and the gamma-electron directional correlation for the 588 – 296 keV cascade. They concluded that the $E0$ component in the $2^+ \rightarrow 2^+$ transition in $^{192}$Pt is with certain probabilities equal to zero. Their\(^7\) results are almost consistent with HIROSE et al.\(^3\) results.

The present value for the mixing ratio of the 296 keV transition is in good agreement with values found by SIMONS et al.\(^8\), $|\delta| = 4.4$, by BUTT and DUTTA\(^9\) $|\delta| = 7.0$ and by HIROSE et al.\(^3\) $|\delta| = 5.5$.

However these values are much lower than the values obtained by REID et al.\(^4\), $|\delta| = 15$.

The value of $\delta$ (293 keV transition in $^{194}$Pt) is $(6.24 \pm 0.55)$. It is of the same magnitude as that of $\delta$ (296 keV transition in $^{192}$Pt).

A definite conclusion was not possible since no angular correlation measurements were made on the $2^+ \rightarrow 2^+$ transition in $^{194}$Pt.

In order to obtain more detailed information about the low-lying collective states in platinum isotopes, it may be of value to measure by angular correlation technique the mixing ratio and the penetration effects in M 1 transition of the 293 keV gamma-ray in $^{194}$Pt.


![Fig. 3. Part of gamma-ray spectrum from $^{192}$Ir.](image1)

![Fig. 4. Part of gamma-ray spectrum from $^{194}$Ir.](image2)