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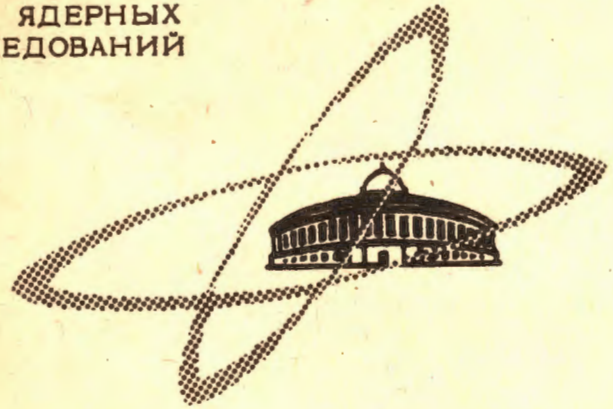

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COULOMB EXCITATION OF ^{189}Os NUCLEUS

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COULOMB EXCITATION OF ^{189}Os NUCLEUS

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Measurements of the coulomb excitation of the ^{189}Os isotope, using 52 MeV ^{12}C ions from the U-150 cyclotron of the Joint Institute for Nuclear Research, were performed. Thick targets of natural osmium and of osmium enriched to 80.1% in ^{189}Os (with 14.7% of ^{190}Os admixture) were used. De-excitation γ-ray spectra were recorded with a Ge/Li/ detector with an area of 1.8 cm^2 and a depletion layer of 7 mm. Examples of obtained spectra are shown in Figs. 1 and 2.

The spectra for the enriched ^{189}Os target show the excitation of the 69.5 keV, 95.3 keV, 219.4 keV and 233.6 keV states. The γ-ray peak at 187.6 keV is due to the de-excitation of the 2^+ state in ^{190}Os.

The level scheme for ^{189}Os was established in the work by Harmatz et al./1/ from the spectra of conversion electrons following the decay of ^{189}Ir. The part of this scheme relevant for the transitions observed in our experiment is shown in Fig. 3.

In earlier coulomb excitation works/2,3/ the excitation of the 233.6 keV state was not observed and the nature of the two neighbouring states 216.7 keV and 219.4 keV was not established/4/.

The application of a Ge/Li/ detector enabled us to make sure that the 219.4 keV state was the strongly excited one and to observe the excitation of the 233.6 keV state. From the measured intensities of γ-lines for the transitions 219.4 keV and 233.6 keV in ^{189}Os and 187.6 keV in ^{190}Os (Fig. 2) the intensity ratios I (219.4)/ I (187.6) and I (233.6)/ I (187.6) were obtained. These ratios, combined with the reduced excitation probability $B/E2, 0^+ \rightarrow 2^+/ = (2.53 \pm 0.25)\ e^2b^2$ for ^{190}Os/5/, with the ratios of cross-over-to-cascade transitions in ^{189}Os/1/,

the energy dependence of the Ge/Li/ detector efficiency and the percentage of the two osmium isotopes in the target, yield the following B/E2/values for the 219.4 keV and 233.6 keV states, respectively:

$$B/E2,\ 3/2 \to 7/2/ = /0.74 \pm 0.11/\ e^2b^2.$$

and

$$B/E2,\ 3/2 \to 3/2/ = /0.08 \pm 0.02/\ \overline{e^2b^2}$$

The ratio of the experimentally obtained reduced excitation probability to the single particle estimate for the 233.6 keV state is equal to 13 ± 3. This value is rather large, which makes questionable the suggestion of Harmatz et al.[1] that the 233.6 keV state is the $3/2^-(503)$ Nilsson state.

The B/E2/ value for the 219.4 keV state can only suggest that this state is of a collective character and it may be either the second excited state of the rotational band built on the ground state or the vibrational level /3/2+2/ depressed by the band mixing.

The 216.7 keV level, whose excitation was not observed in our experiment, is most probably of a single particle character.

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References

1. B.Harmatz, T.H.Handley, J.W.Mihelich. Phys.Rev., 128, 1186 (1962).
2. R.Barloutaud. Rapport C.E.A., No 1531 (1960).
3. F.K.McGowan, P.H.Stelson, R.L.Robinson, J.L.C.Ford. Bull.Amer.Phys. Soc., 8, 548 (1963).
4. Nuclear Data, 1, B1-2-87 (1966).
5. F.K.McGowan, P.H.Stelson. Phys.Rev., 122, 1274 (1961).

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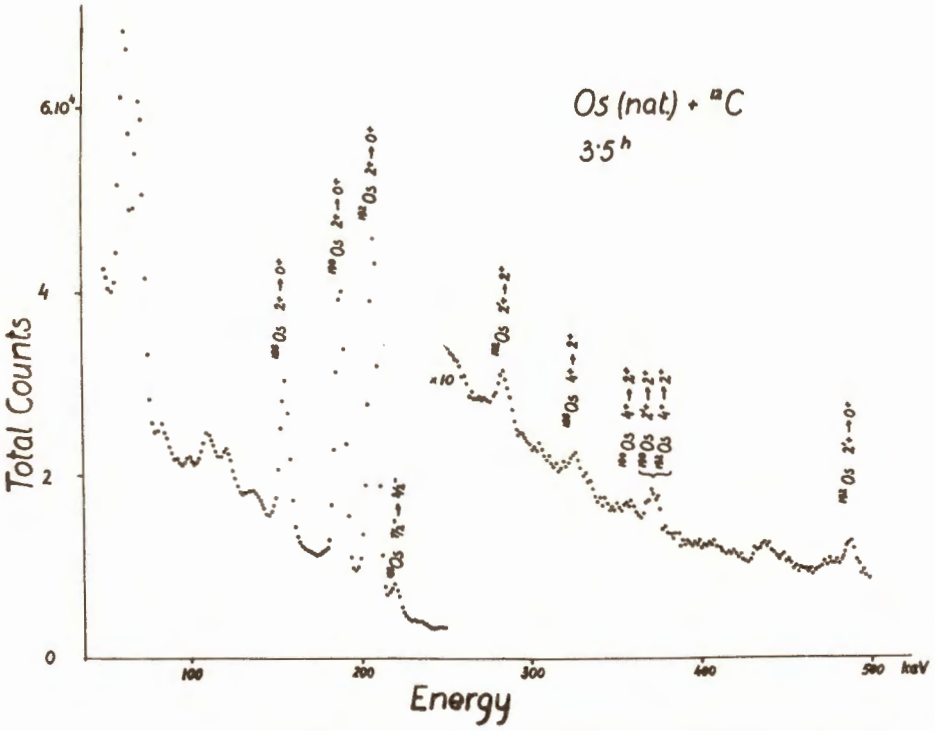

Fig. 1. Gamma-ray single spectrum for the thick target of natural osmium

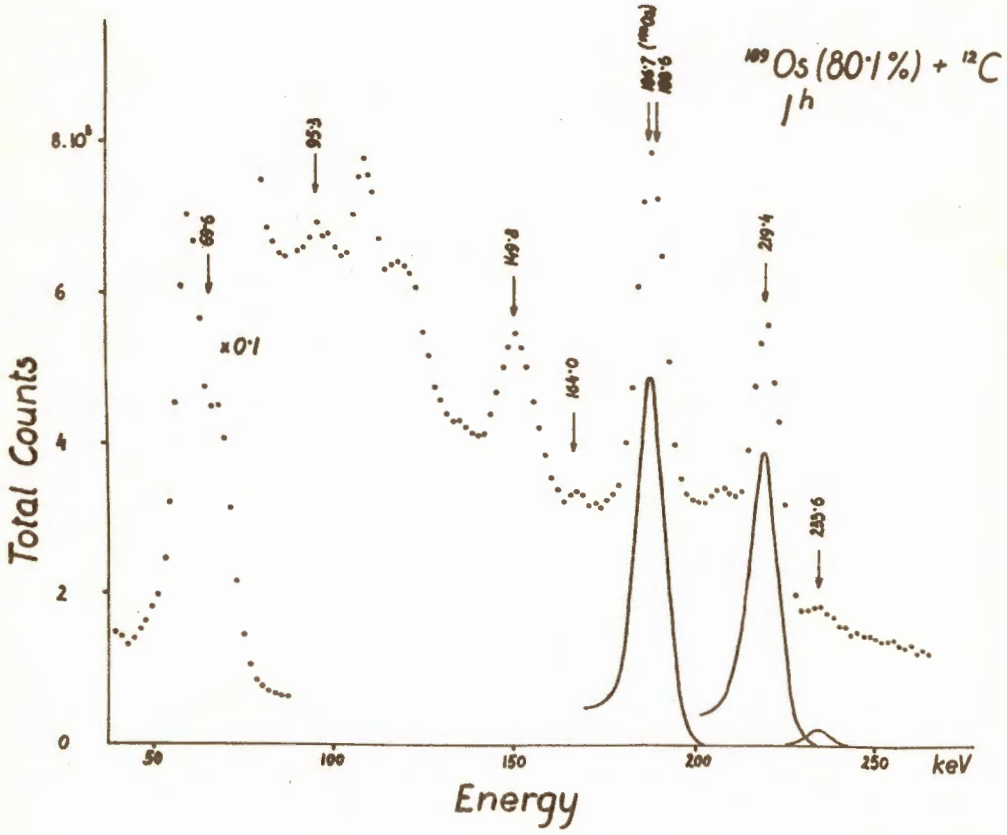

Fig. 2. Gamma-ray single spectrum for the thick target enriched in ^{189}Os.

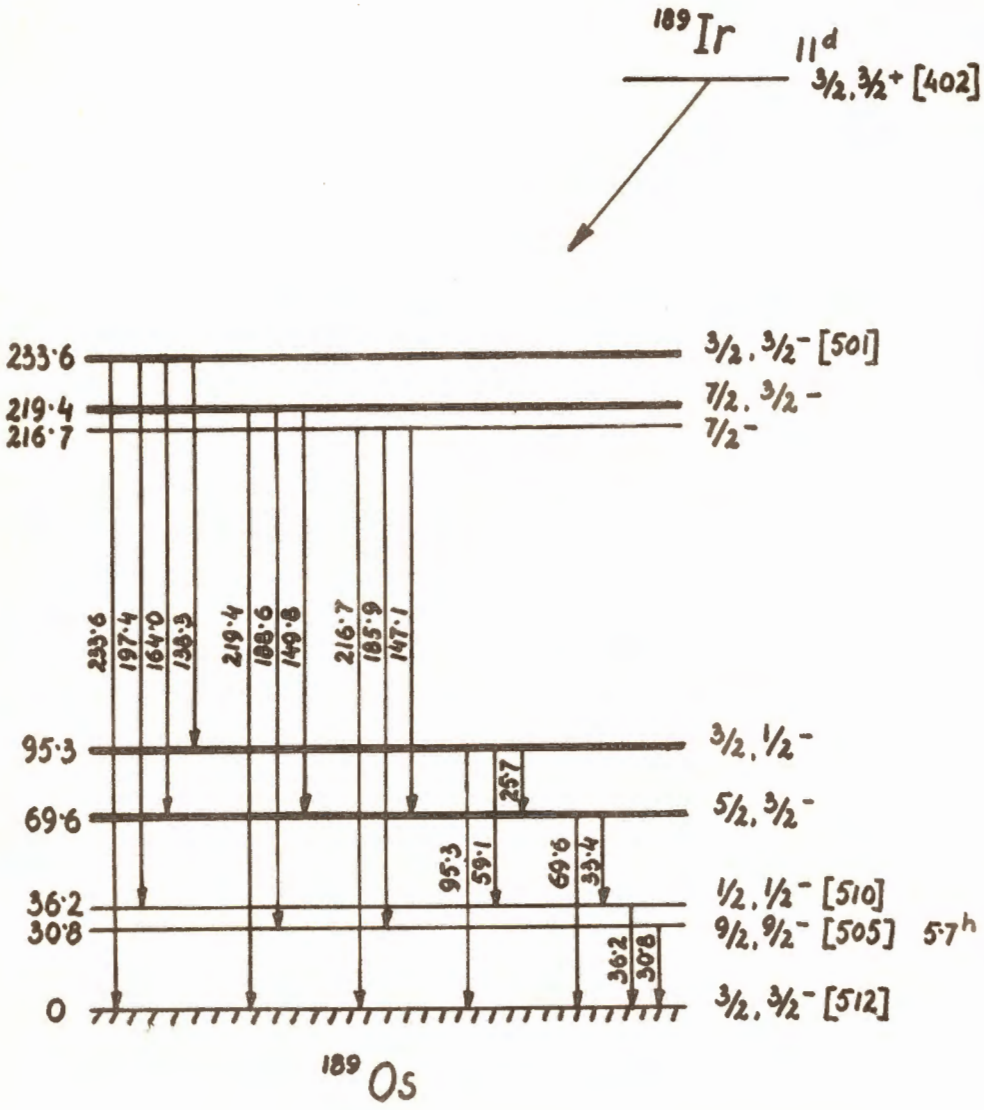

Fig. 3. The relevant part of the decay scheme of ^{189}Os. States excited in the present work are denoted by heavy lines.