ОБЪЕДИНЕННЫЙ
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ДУБНА

E15 - 9825

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CORRELATION BETWEEN THE ANGULAR MOMENTUM OF RECOIL NUCLEI AND THE NEUTRON MULTIPLICITY IN THE (π^-, Xn) REACTION

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Submitted to "Письма в ЖЭТФ"

It is known that stopped pion capture by complex nuclei leads to the emission of the large number of neutrons and the excitation of high-spin states in residual nuclei /1/.

In this work an attempt has been made to establish the interrelation of these two phenomena, that comes to *the determination of the high-spin isomer production* probability in dependence on the number of emitted neutrons.

Experimentally, isomeric ratios in ^{108}In and ^{110}In isotopes produced in the pion activation of even mass tin isotopes (*Table 1*) have been determined.

Table 1
The target indices

Targets	^{112}Sn	^{114}Sn	^{116}Sn	^{118}Sn	^{120}Sn	^{122}Sn	^{124}Sn
Enrichment %	80.0	70.0	98.0	98.3	99.2	92.1	97.9
Weight (gram)	5.0	9.2	10.4	9.0	9.0	10.0	9.0

Irradiation, cooling and measuring times were the same for all targets, and equal to 30, 4 and 30 minutes, respectively, with an accuracy of about 10 seconds. Measurements were performed under the strictly reproducible geometry and with the same operation conditions of a Ge(Li) spectrometer. Due to small target thickness (h ≤ mm) self-absorption for gamma rays of the energy above 600 *keV* could be neglected. Because of the low counting rate no dead-time corrections were needed.

Figure 1 (a,b) shows the parts of gamma ray spectra containing the most intensive lines of $^{108,\,110}$In isotopes which were used to determine the isomeric ratios.

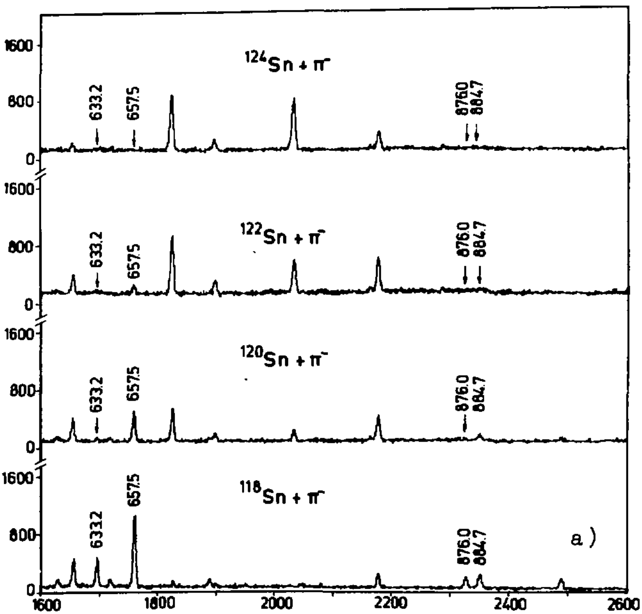

Fig. 1. Parts of gamma-ray spectra containing most intensive lines of $^{108,\,110}$In *isotopes. For* $^{120,\,122}$Sn *cases arrows show positions of very weak lines which can be identified only by a statistical evaluation.*

Table 2
The properties of $^{108,110}In$

	$T_{1/2}$	J^{π}	E_{γ} keV	I_{γ}^{rel}
^{108m}In	>6 min	6^+	633.2 876.0	100 85
^{108g}In	39 min.	3^+	633.2	100
^{110m}In	4.5 h	7^+	657.5 884.7	100 96
^{110g}In	69 min.	2^+	657.5	100

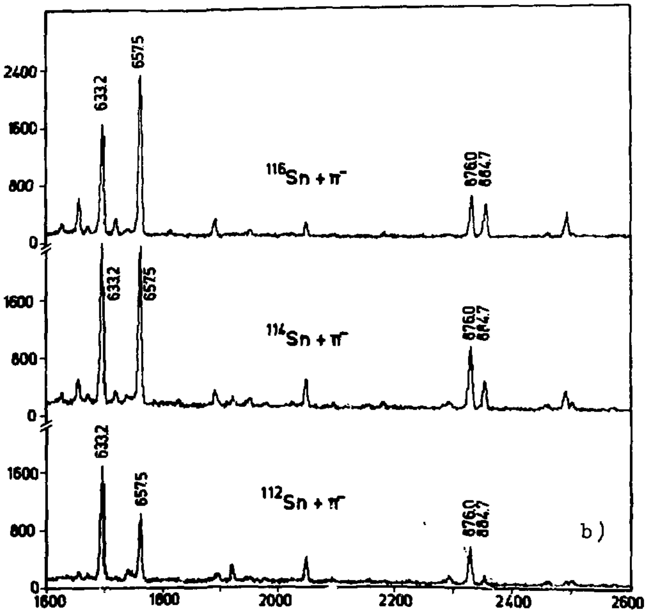

Fig. 1b.

In both indium isotopes, $^{108,110}In$, electromagnetic transition between high- and low-spin isomers is absent and they undergo the independent beta decay. Therefore the isomeric ratios should be proportional to gamma-ray yield ratios and were calculated from the corresponding line photopeak areas. *Figure 2* shows the extracted values of the isomeric ratio in arbitrary units

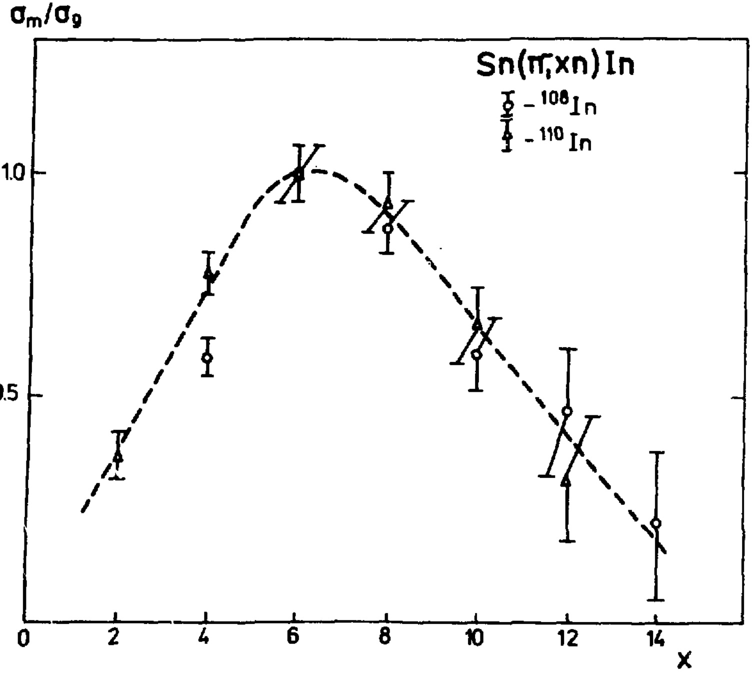

Fig. 2. Dependence of isomeric ratios on the neutron multiplicity. All the values are normalized to the x=6 *case.*

versus the number of emitted neutrons. As is seen, the isomeric ratio increases when neutron multiplicity grows from 2 to 6, then it decreases with further increasing X. (In the case of a ^{124}Sn target a very small yield of $^{108,110}In$ makes it impossible to find the $\sigma m/\sigma g$ ratios).

The experimental results are in qualitative agreement with statistical model calculations /2/ and indicate great role of intranuclear cascade in the formation of the recoil angular momentum.

The authors express their deep gratitude to V.P.Dzhelepov, L.I.Lapidus, K.Ya.Gromov, V.M.Sidorov, and A.S.Ilyinov for support and helpful discussions.

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Received by Publishing Department on May 25, 1976.