

A possible explanation is that activation measurements are influenced by the presence of ~ 1 MeV neutrons produced by the $(n, 2n)$ reaction in the target. Preliminary calculations⁵⁾, made for holmium indicate that up to 25% of the measured activation could be accounted for by this interpretation. It is not likely that reactions of the type (n, nX) could explain the rest of the order of magnitude difference between σ_{act} and σ_{int} .

Our results thus present the beginning of a systematic measurement of 14 MeV (n, γ) cross sections by the activation method with the double aim to reduce the scattering of various experimental results and to look for the systematic differences with σ_{int} . So far the results in the $d_{3/2} - f_{7/2}$ region have confirmed the earlier prediction in the sense that σ_{act} is consistently larger than σ_{int} .

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6.7. Isomeric cross section ratios for (n, p) reactions induced by 14.6 MeV neutrons in Te isotopes

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Introduction. Measurement of the ratio of the yield of isomeric pairs as a function of energy is a useful tool for the investigation of the mechanisms of the nuclear reactions. Huizenga and Vandendoorn¹⁾ have developed a method for calculating the theoretical isomeric ratio in (x, n) reactions on the basis of the statistical theory.

Although the isomerism in isotopes of tellurium is well established, the available data on the yield ratio for the isomeric pair formation of tellurium isotopes is surprisingly small, particularly for the 14–15 MeV neutrons. In this work we have measured the (n, p) cross sections for the metastable and ground states of all unstable tellurium isotopes. The choice was, moreover, influenced by the desire to investigate further the effect known from the works of Ľevkovski^{2,3)}, Gardner⁴⁾ and others^{5,6,7,8)}. This effect consists in a regular decrease of the (n, p) cross sections of isotopes of the same element with the increase of the mass number.

Experimental. Natural tellurium was used in the form of chemically pure and specpure powders. Enriched $^{120,122,124,126,128,130}\text{Te}$ used in the work were obtained from the Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Irradiations were performed at 14.6 ± 0.2 MeV with neutrons obtained from the $^2\text{H} + ^3\text{H}$ reaction using 200 keV Cockcroft-Walton generator of the Institute »Ruder Bošković«. The neutron flux was about 2×10^9 n/sec, and the total neutron yield was monitored by the associated α -particles. The duration of irradiation time was varied from several minutes to several hours depending on the half-life of the products. Gamma-ray spectra were measured using 25 cm³ Ge(Li) detector coupled to the 400-channels analyser.

TABLE

Target	Product	Exp. val. (mb)	σ_m/σ_p	Theoretical values									
				$\sigma = 3$ or 4					$\sigma = 7$				
				ν					ν				
				1	2	3	4	5	1	2	3	4	5
^{120}Te	^{120m}Sb	64 ± 10	0.78	.241	.243	.247	.251	.273	.505	.584	.588	.669	.722
	^{120e}Sb	82 ± 13											
^{122}Te	^{122m}Sb	21 ± 6	0.81	.120	.130	.138	.144	.148	.302	.364	.422	.473	.519
	^{122e}Sb	17 ± 3											
^{124}Te	$^{124m1}\text{Sb}$	5 ± 0.8	0.38	.830	.870	.882	.923	.949	.644	.648	.638	.637	.632
	$^{124m2}\text{Sb}$	2 ± 0.3											
	^{124e}Sb	13 ± 2	0.15	.272	.337	.386	.434	.475	.159	.172	.179	.183	.185
^{126}Te	^{126m}Sb	1.5 ± 0.1	0.50	.177	.212	.240	.268	.286	.262	.328	.376	.423	.466
	^{126e}Sb	3 ± 0.9											
^{128}Te	^{128m}Sb	1 ± 0.1	0.67	—	—	—	—	—	—	—	—	—	—
	^{128e}Sb	1.5 ± 0.3											
^{130}Te	^{130m}Sb	0.9 ± 0.2	0.64	—	—	—	—	—	—	—	—	—	—
	^{130e}Sb	1.4 ± 0.3											

for ^{126}Te $\sigma = 3$

Results. In the Table the experimental and theoretical isomeric ratios for (n, p) reactions are shown. Calculations of the isomeric ratio were performed for several values of ν ($\nu = 1, 2, 3, 4, 5$) and for several values of the cut-off parameter σ ($\sigma = 3, 4, 7$) included in the known formula for spin-dependent level density⁹⁾:

$$g(\mathcal{J}) \propto g(0) (2\mathcal{J} + 1) \exp[-(\mathcal{J} + 1/2)^2 / 2\sigma^2]$$

The calculations are based on the theory of the reactions occurring through the compound nucleus.

Our measured values for isomeric ratio are in reasonable agreement with the previously measured values of Husain and Kuroda¹⁰⁾, but in complete disagreement with Brzosko et al.¹¹⁾.

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6.8. The distortion of the deuteron by the Coulomb field*

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