DEPENDENCE OF BRANCHING COEFFICIENTS FOR MULTIDECAY NUCLEI FROM *K*-SHELL POPULATION OF THEIR ATOMS IN STRONGLY HEATED MEDIUM

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In [1] we have calculated the δ branching coefficients for a number of multidecay odd-odd nuclei in an extremely heated medium. The δ coefficient determines the fraction of the electron beta-decay in the total decay rate for multidecay nucleus. The range of nuclear temperatures from 0.2 to 0.3 MeV which corresponds to the stage of the oxygen layer burning in massive star was considered. In the extremely heated medium the atomic ionization multiplicity, including the *K* shell, is high and the capture of atomic electrons by the nucleus is hindered. This effect for multi-decay nuclei with anomalously small values of the branching coefficients can significantly increase the contribution of their electronic beta-decay.

The aim of the research is to investigate how the ionization of an atomic *K* shell in a high-temperature field varies the δ coefficients for the multidecay nuclei. In the mass-number range between 74 and 196 there are 33 of such nuclei. The results obtained by calculating the δ coefficients for some multidecay nuclei are given in the table.

The calculated branching coefficients for multidecay nuclei. Here, δ_0 is the branching coefficient received in the terrestrial conditions [2]; column 1 is the calculations accounting K-capture [1], column 2 is the calculations without it; columns 1 and 2 contain the results for $T = 3\times10^9$ K

Nucleus	δ_0	δ, theory		Nucleus	δ_0	δ, theory	
		1	*2*			*1*	*2*
$^{92}_{41}$Nb	$<5.0\times10^{-4}$	0.082	0.441	$^{144}_{61}$Pm	0	4.4×10^{-4}	0.908
$^{96}_{43}$Tc	0	6.1×10^{-5}	5.7×10^{-3}	$^{156}_{65}$Tb	0	6.7×10^{-4}	0.180
$^{102}_{45}$Rh	0.2	0.112	0.841	$^{162}_{67}$Ho	0	4.2×10^{-3}	0.537
$^{120}_{51}$Sb	0	0.169	0.773	$^{180}_{73}$Ta	0.14	0.532	1.0
$^{124}_{53}$I	0	7.6×10^{-4}	0.025	$^{184}_{75}$Re	0	6.3×10^{-6}	0.124
$^{132}_{55}$Cs	0.019	0.201	0.998	$^{190}_{77}$Ir	0	1.0×10^{-4}	0.770
$^{136}_{57}$La	0	2.4×10^{-3}	0.964	$^{196}_{79}$Au	0.075	1.3×10^{-3}	1.0

The action of the high-temperature field on beta processes and the suppression of the electron *K* capture change substantially the δ coefficients in the relation to their δ_0 values. The δ values presented in the table may be of interest not only as it is but also for the models intended for describing the synthesis of *p*-nuclei at various stages of massive-star evolution.

1. I.V.Kopytin *et al.* // Phys. Atom. Nucl. 2013. V.76. P.1315.
2. R.B.Firestone *et al.* Tables of Isotopes, 8th ed. New York: Wiley, 1996.