[24/09/2000 - Painel]

Excited levels in ^{149}Pm

Ilca Marli Moitinho Amaral Medeiros, Cibele Bugno Zamboni, José Agostinho Gonçalves de Medeiros, Frederico Antonio Genezini, Laura Cristina de Oliveira, Marco Antonio Mafchio
Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN-SP
Manoel Tiago Freitas da Cruz, Juan Yury Zevállos Chávez, Vito Vanin
Instituto de Física da Universidade de São Paulo

There are many indications of a sudden change in the nuclear equilibrium shape around the mass number 150. In particular, the neutron number has been found to be important, implying a spherical shape of a nucleus with N=88 and a deformed shape for N=90. To study this important phenomenon, transitions and levels in ^{149}Pm have been investigated by means of γ-ray spectroscopy and $\gamma\gamma$ coincidence measurements using high-resolution HPGe detectors . The sources used in theses measurements were obtained by irradiation of 94% enriched ^{148}Nd in the form Nd_2O_3 in the IEA -R1 Reactor at IPEN-SP for a few minutes (1 to 4 min). The energy calibration and the relative efficiencies of the detectors were done using standard gamma rays of ^{60}Co, ^{109}Cd, ^{133}Ba, ^{137}Cs and ^{152}Eu. Several γ-ray spectra of ^{149}Nd were measured over the energy region from 20 to 1700 keV for singles and coincidence experiments. There were considerable difficulties in data evaluation in function of the spectra be complex with a lot of multiplex.

From the singles analysis a number of new transitions were proposed and the results are given in Table I and the $\gamma\gamma$ coincidence relations in Table II.

Table I: Energy (Eγ), relative intensity (Iγ), of γ-ray in the β^- decay of ^{149}Nd, observed for the first time. The intensity values are relative. to a value of 1000 for the 211 keV

Energy(keV)	*Iγ(%)*	*Energy(keV)*	*Iγ(%)*
39.065 (9)	-	771.99 (4)	1.0 (5)
44.341 (14)	252 (12)	791.82 (4)	1.74 (7)
59.652 (8)	78.2 (9)	806.06 (7)	1.13 (9)
67.20 (19)	1.7 (4)	835.18 (6)	1.24 (8)
69.510 (21)	2.5 (3)	839.24 (5)	1.0 (8)
77.176 (20)	7.41 (23)	851.23 (5)	1.4 (11)
80.305 (10)	17.4 (3)	859.82 (14)	9.3 (9)
90.12 (5)	1.99 (11)	910.88 (11)	69.7 (4)
92.89 (3)	20.16 (13)	924.21 (10)	1.6 (3)
171.17 (10)	1.24 (22)	929.78 (6)	1.52 (17)
224.49 (6)	0.92 (9)	933.24 (4)	2.25 (21)
238.637 (3)	32.64 (8)	976.0 (5)	0.20 (12)
290.378 (7)	19.66 (11)	1015.99 (18)	0.45 (14)
332.167 (18)	0.68 (4)	1153.93 (12)	0.45 (6)
371.92 (6)	0.86 (10)	1180.54 (26)	1.53 (11)
413.693 (15)	0.82 (4)	1206.7 (3)	0.14 (6)
434.90 (7)	0.14 (4)	1237.61 (4)	1.49 (9)
590.74 (17)	0.16 (4)	1293.42 (4)	0.07 (3)
652.744 (7)	26.46 (15)	1500.97 (20)	0.20 (3)
665.22 (7)	0.59 (4)	1508.57 (7)	0.44 (4)
736.18 (11)	0.71 (16)	1513.6 (3)	0.10 (3)

Table II: $\gamma\gamma$ coincidence relations

Energy (keV)	γ-rays in coincidence (keV)
39.1	74.9, 156.0, 199.1, 213.9
44.3	39.1, 156.0
80.3	39.1
59.6	192.2, 211.4, 270.2
67.2	156.0, 288.3, 540.5
69.5	97.3, 423.6
77.2	39.1
171.2	326.6
238.6	74.9, 97.3, 114.6, 229.6
290.4	39.1, 44.3, 74.9, 114.6, 229.6, 270.2, 326.6, 366.7
332.2	301.1
652.7	349.2, 376.7
806.1	245.8, 288.3, 311.6, 425.8
976.0	211.4
1181.0	117.1

Using a multidetector acquisition system [1] and the BIDIM program [2] in coincidence data analysis, a number of new, weak transitions were proposed and many multiplets could be resolved. The energy and intensity of 44 new and 32 transitions have been determined with better overall precision than previously, besides the present results together with the results of earlier studies [3, 4, 5, 6] also permitted definite assignments of spins to the majority of levels in ^{149}Pm.

References

[1] D. Barg F. R. C. Neves e V. R. Vanin, *Proceedings of the XX Brazilian Workshop* , Guaratinguetá - p.424 -6, 1996.

[2] Z.O.G. Filho. Medidas Precisas de Energias de Transições Gama em Coincidência. Espectroscopia das Séries do 232U e 233U. *Tese de mestrado apresentada no Instituto de Física da Universidade de São Paulo - IFUSP*,1998.

[3] E. W. Schneider, M. D. Glascock and W. B. Walters *Z. Physik* , A291:77-86, 1979.

[4] H. Iimura, T. Seo and S. Yamada *Physical Society of Japan*, 55:1108-21, 1986.

[5] C. H. Chen and R. G. Arns *Nucl. Phys.*, 63:233, 1965.

[6] I. Hideki, Takeshi S.Y. Shigeru, J. *Phys. Soc. Jap.*.55: 1108,1986.

[24/09/2000 - Painel]

DIRECT AND PREEQUILIBRIUM PROCESSES IN $1p-1h$ DECAY OF GIANT RESONANCES

M. O. Roos[1,2], O. Rodriguez[2,3], H. Dias[2], M. S. Hussein[2]

[1] *Depto. de Física, Univ. Federal de Mato Grosso,* [2] *Inst. de Física, Univ. de São Paulo,* [3] *ISCTN, La Habana, Cuba*

The total escape width of a giant resonance (RG) can be considered with deriving of two basic statistical processes: the direct process and the process of preequilibrium. In the direct process, one nucleon escapes of the nucleus and it does not have change in the type of configuration of the composite nucleus (nucleon that it escapes plus residual core). In the preequilibrium process, a nucleon escapes and the composite nucleus acquires a more complicated configuration (eg.: $1p-1h$ to $2p-2h$). We present a deduction of escape width of giant resonances in statistical direct process of $1p-1h$ decay. The deduced expressions are analogous of the Statistical Multi-Step Compound Theory [1] [2], however the discontinuities, that appear when we have as initial pattern a nucleus excited in a RG with a collective configuration of the $1p-1h$ type, are removed. A calculation of the total escape width of RG's is made considering in such a way the contributions of the direct as of preequilibrium processes and the results are compared with experimental data. The theoretical calculations are performed for the ^{40}Ca, ^{90}Zr and ^{208}Pb nuclei. On the basis of the results we make an interpretation with respect to the type of dominant process in the $1p-1h$ decay of each of these nuclei. Our studies reveal in agreement with the results found in literature.