The ^{112}Sn(p,t)^{110}Sn Reaction

P. Guazzoni [a], L. Zetta [a], A. Covello [b], A. Gargano [b], G. Graw, R. Hertenberger, H.-F. Wirth, B.F. Bayman [c], and M. Jaskóla [d]

[a] Dipartimento di Fisica dell'Università and I.N.F.N, I-20133 Milano, Italy
[b] Dipartimento di Scienze Fisiche dell'Università and I.N.F.N, I-80126 Napoli, Italy
[c] Physics and Astronomy Department, University of Minnesota, Minneapolis, USA
[d] Soltan Institute for Nuclear Studies, Warsaw, Poland

The Sn isotopes have been the object of many experimental and theoretical investigations aimed at understanding their shell model structure. The two-neutron transfer reactions as (p,t) are very sensitive to pairing correlations in the overlap between initial and final states and for this reason have been used to determine detailed spectroscopic information on tin nuclei.

In recent years, in the framework of a systematic study of tin isotopes using (p,t) reaction in high resolution experiments, we reported the results for ^{120}Sn and ^{114}Sn nuclei [1,2] together with the predictions of realistic shell-model calculations for these nuclei. In this contribution we have extended our study to the ^{112}Sn(p,t)^{110}Sn reaction. The level structure of ^{110}Sn has been investigated by different experimental measurements, summarized in the NDS compilation [3], where a complete list of references is reported.

Differential cross sections of 25 transitions to ^{110}Sn up to an excitation energy of 4317 keV were accurately measured, allowing to confirm and identify spin and parity for all the observed levels.

In Table 1 all information available in literature [3] and the results of the present transfer reaction experiment are summarized.

Adopted		Present Experiment			Adopted		Present Experiment		
E_{exc} (keV)	J^π	E_{exc} (MeV)	J^π	σ_{int} (μb)	E_{exc} (keV)	J^π	E_{exc} (MeV)	J^π	σ_{int} (μb)
0.0	0^+	0.0	0^+	1309 ± 14			3.083	2^+	16 ± 1
1211.88	2^+	1.212	2^+	198 ± 6	3153	2^+			
2120.92	(2)				3182.8	$(2^+,3^+,4^+,5^+)$			
2196.92	4^+	2.197	4^+	61 ± 2			3.183	0^+	17 ± 1
2302	0^+	2.309	0^+	12 ± 1	3222.5	$(2^+,3^+,4^+,5^+)$			
2455.5	4^+				3252	4^+			
2459	(3^-)				3320	2^+			
		2.462 D	$4^+ + 3^-$	88 ±2	3357	5^-			
2477.7	6^+	2.478	6^+	44 ± 1			3.421	2^+	6.3 ± 0.5
2545.5	2^+	2.545	2^+	36 ± 1	3446.6	$(2^+,3^+,4^+,5^+)$			
2579	0^+	2.573	0^+	7.1 ± 0.5	3540.4	(2,3,4)	3.540	4^+	3.3 ± 0.4
2694.4	4^+	2.694	4^+	11 ±1			3.609	4^+	5.5 ± 0.5
2745	0^+	2.742	0^+	18 ± 1	3629.7	$(2^+,3^+,4^+,5^+)$			
2753.8	$(6)^+$	2.753	6^+	6.5 ± 0. 5	3687.0	$(7)^-$			
2802.3							3.751	2^+	5.3 ± 0.4
2821.3	(2,3,4,5)				3765.2	$(8)^-$			
2833.4	2^+				3807				
		2.857	2^+	7.7 ± 0.5			3.812	2^+	11 ± 1
2914.7	2^+				3812.5	$(8)^+$			
2948.1	$(2^+,3^+,4^+,5^+)$						3.844	5^-	14 ± 1
2964.8		2.965	2^+	14 ± 1	3884.9	$(2^+,3^+,4^+,5^+)$	3.885	3^-	2.6 ± 0.3
2977.0					3933.1	$(9)^-$			
2983	4^+				3971				
2997	(2^+)						4.132 D	$3^- + 5^-$	5.1 ± 0.4
		3.059	4^+	36 ± 1	4158				
3060	0^+				4316.8	(10)	4.317	4^+	4.1 ± 0.4

Table 1: Columns 1 and 2 give the adopted [3] energies, spins and parities of the ^{110}Sn levels; columns 3 and 4 the energies, spins and parities observed in the present work; column 5 gives the integrated cross sections from 5° to 60°. In column 5 absolute cross sections are reported together with the statistical errors.

Spin-parity assignments have been done for all the observed levels. In particular, 9 levels have been observed for the first time and identified in J^π, 10 levels have been confirmed with respect to the levels reported in NDS [3], and 4 ambiguities removed. Two unresolved doublets have been observed, giving 1 confirmation, 1 removed ambiguity and 2 new assignments.

References

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