Study of the ^{124}Sn(p,t)^{122}Sn Reaction at 25 MeV

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In the framework of a systematic study of even tin isotopes via the (p,t) reaction, in a high resolution experiment at the Munich HVEC MP Tandem we have measured the ^{124}Sn(p,t)^{122}Sn reaction at 25 MeV proton incident energy. The 80 μg/cm^2 ^{124}Sn isotopically-enriched (96.71%)target on a 15 μg/cm^2 carbon backing was used. The reaction products were momentum separated by the Q3D magnetic spectrograph, at 8 angles from 10^o to 52.5^o and detected by the 1.8 m long focal plane detector for light ions [1].

We have measured 63 transitions to final states of ^{122}Sn of which 9 have been observed for the first time. We have assigned spin and parity values to all the observed levels, by means of a DWBA analysis performed in finite range approximation, assuming a semimicroscopic dineutron cluster pickup mechanism. The optical model parameters used were the same as those used for the analysis of the ^{112}Sn(p,t)^{110}Sn reaction [2].

Table 1 summarizes the results obtained in the present experiment: the adopted energies, spins and parities of the ^{122}Sn levels [3] are listed in comparison with the results of the present work. The integrated cross sections from 10^o to 52.5^o are also reported.

References

[1] E. Zanotti *et al.*, Nucl.Instr. Meth. Phys. Res. **A310** (1991) 706
[2] P. Guazzoni *et al.*, Phys.Rev. **C74** (2006) 054605
[3] T. Tamura, Nucl. Data Sheets **108** (2007) 455

Levels of ^{122}Sn

Adopted		Present experiment		
E_{exc} (keV)	J^π	E_{exc} (MeV)	J^π	σ_{int} (μb)
0.0	0^+	0.0	0^+	958 ± 15
1140.51	2^+	1.141	2^+	370 ± 10
2087.71	0^+	2.088	0^+	28 ± 1
2142.06	4^+	2.142	4^+	43 ± 2
2153.81	2^+	2.154	2^+	14 ± 1
2245.81	5^-	2.245	5^-	148 ± 3
2331.09	4^+	2.331	4^+	69 ± 2
2409.03	7^-	2.409	7^-	66 ± 2
2415.543	2^+	2.416	2^+	187 ± 3
2492.67	3^-	2.493	3^-	171 ± 3
2530.33	$(0)^+$	2.530	0^+	0.8 ± 0.2
2555.42	6^+	2.556	6^+	14 ± 1
2651.37	4^-,5^-,6^-			
2653.00	6^-			
		2.654	$6^+ + 4^+$	6 ± 1
2657				
2675.57	0^+	2.676	0^+	47 ± 2
2690.04	(8^+)	2.690	7^-	8 ± 1
2734.50	2^+	2.735	2^+	4 ± 1
2751.01	5^-	2.752	5^-	15 ± 1
2765.6	(10^+)	2.766	6^+	4 ± 1
2775.55	2^+	2.776	2^+	17 ± 1
2837.88	6^-	2.838	6^+	8 ± 1
2855.47	4^-	2.855	4^+	2.1 ± 0.4
2867.73		2.868	0^+	4 ± 1
2879.79	1^+,2^+	2.880	1^-	2.4 ± 0.5
2944.96	3^+			
2959.12	4^+			
		2.960	2^+	1.6 ± 0.3
2971.1				
2973.39	4^+	2.973	4^+	10 ± 1
3035.91	3^-	3.036	3^-	2.2 ± 0.4
		3.072	4^+	1.1 ± 0.3
3082.15	4^+	3.082	4^+	8 ± 1
3128.6	2^+	3.128	2^+	23 ± 1
3130.58				
3206.25	$(0)^+$	3.206	0^+	5 ± 1
3233.74	4^+	3.234	4^+	158 ± 3
3281.43		3.282	5^-	2.2 ± 0.4
3305.69	4^+	3.306	4^+	110 ± 3
3330				
3358.59	1^-	3.358	1^-	7 ± 1
3362.87	3^-	3.364	3^-	5 ± 1

Levels of ^{122}Sn

Adopted		Present experiment		
E_{exc} (keV)	J^π	E_{exc} (MeV)	J^π	σ_{int} (μb)
3371.24	(2^+)			
3416.5	$(7^-,8^-,9^-)$			
3454.82	(3^-)	3.455	3^-	11 ± 1
		3.478	4^+	3 ± 1
3478.60	(7^-)			
		3.529	4^+	12 ± 1
3530.71	$(7^-,8^-)$			
3548.66	2^+			
		3.549	1^-	2.4 ± 0.4
3568.14		3.564	7^-	6 ± 1
3582.35	2^+	3.583	2^+	5 ± 1
3627.01	4^+	3.627	4^+	3 ± 1
		3.653	2^+	4 ± 1
		3.661	4^+	10 ± 1
3670.28	4^+	3.670	4^+	28 ± 1
		3.683	3^-	7 ± 1
		3.692	2^+	1.2 ± 0.3
3703.38	$(7^-,8^-,9^-)$			
		3.704	$2^+ + 7^-$	30 ± 1
3704.9	(2^+)			
3710.15	$(7^-,8^-)$			
3730.00		3.729	3^-	6 ± 1
3751.3	2^+	3.752	2^+	6 ± 1
		3.758	6^+	1.7 ± 0.3
3758.51	$1,2^+$			
3777.0		3.775	5^-	4 ± 1
3782.84	$(4)^+$	3.783	2^+	3 ± 1
3810	$^+$	3.810	4^+	9 ± 1
3818	(6^+)			
3819.79	2^+	3.820	2^+	2.7 ± 0.4
3840.65	(4^+)	3.841	4^+	38 ± 2
		3.855	3^-	2.8 ± 0.4
		3.871	5^-	12 ± 1
3871.1	$1,2^+$			
3876.53	5^-,6^+			
3882.10	4^+	3.882	4^+	31 ± 1
3899.68	0^+,1^+,2^+	3.899	2^+	91 ± 2
3900				
3929.9	$1,2^+$	3.930	2^+	14 ± 1
3948.5	5^-,6^+			
3974		3.966	5^-	20 ± 1
4004.1	(2^+)	4.004	2^+	44 ± 2