^{120}Sn Levels Homologous to the Lowest Energy States of ^{119}In

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Starting from about 3.6 MeV of excitation energy, 27 levels of ^{120}Sn have been identified in the $^{123}\mathrm{Sb}(\vec{p},\alpha)^{120}\mathrm{Sn}$ reaction [1] as homologous to the lowest energy levels of ^{119}In populated in the $^{122}\mathrm{Sn}(\vec{p},\alpha)^{119}\mathrm{In}$ reaction [2]. The identification has been performed comparing angular distributions of cross sections and asymmetries with the respective distributions for the parent states in ^{119}In , i.e. $\frac{9}{2}^+$ G.S., $\frac{1}{2}^-$ 0.311 MeV, $\frac{3}{2}^-$ 0.604 MeV and $\frac{5}{2}^-$ 1.044 MeV.

These states (parent and homologous) show significantly different angular distributions of $\sigma(\theta)$ and $\mathrm{A}_y(\theta)$ to allow a reliable discrimination of the multiplets of homologous states. For all multiplets of states there is evidence for fragmentation of some missing members: in this case we assign only parity. Because of the coupling of the $1g_{7/2}$ proton with the positive- or negative-parity parent states, the parity of the ^{120}Sn daughter states is positive or negative respectively. The spins of the ^{120}Sn homologous levels are attributed following the (2J+1) rule: if the coupling between parent state and 51st unpaired proton is weak, the relative cross section for the population of a homologous state with spin J_i in a given multiplet must be proportional to $(2J_i+1)$. In fact, the cross section of a homologous state can be related to that of the corresponding parent state by means of the expression $\sigma(J_i)_{^{120}Sn} = \frac{(2J_i+1)\sigma_{^{119}In}}{\Sigma_i(2J_i+1)}$.

In Figure 1 the quantities $\frac{\sigma(J_i)_{^{120}Sn}}{\sigma_{^{119}In}}\Sigma_i(2J_i+1)$ for each multiplet of ^{120}Sn states homologous to the ^{119}In parent states we have identified are reported as a function of J$_i$, together with the straight $(2J_i+1)$ line.

In Figure 2 the cumulative cross sections and analyzing powers for population of all multiplets of states of ^{120}Sn homologous to the low-lying parent states of ^{119}In, including the fragmented level contributions, are compared with the cross sections and analyzing powers for the population of these ^{119}In states.

References

[1] P. Guazzoni *et al.*, Annual report 2002, p. 11
[2] P. Guazzoni *et al.*, AIP **570** (2001) 664

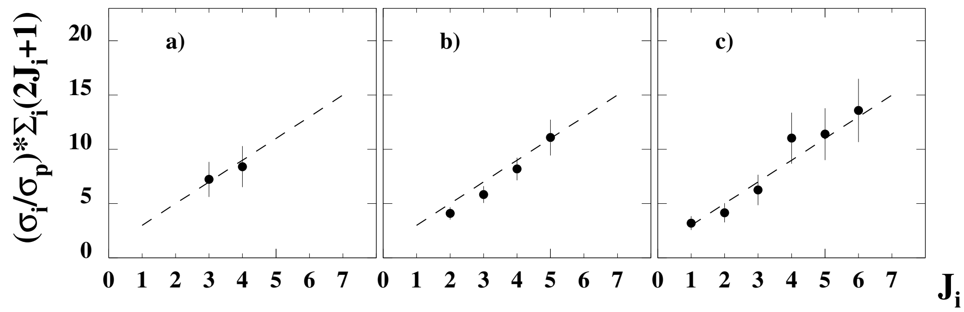

Fig. 1: The experimental quantities $\frac{\sigma_{daughter}(^{120}Sn,J_i)}{\sigma_{parent}(^{119}In)}\Sigma_i(2J_i+1)$ (dots) are reported for each member of the multiplets vs. J$_i$, together with the straight $(2J_i+1)$ line (dashed lines): a) for the multiplet homologous to the ^{119}In 0.311 MeV level; b) for the multiplet homologous to the ^{119}In 0.604 MeV level; c) for the multiplet homologous to the ^{119}In 1.044 MeV level.

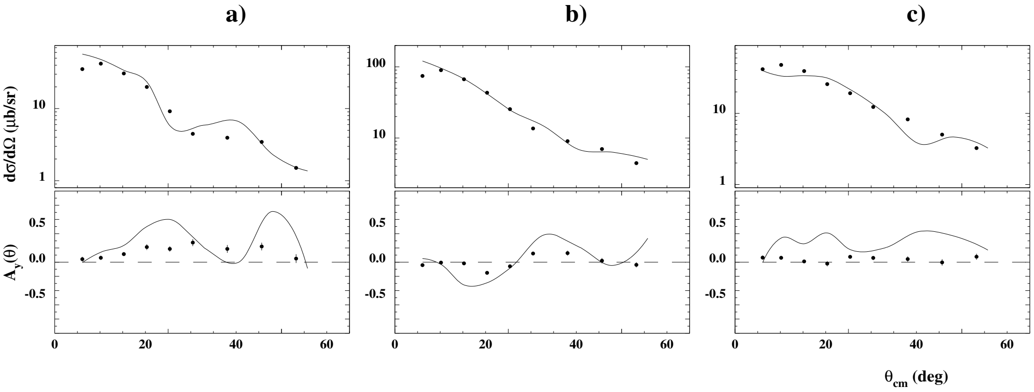

Fig. 2: Cumulative cross sections and analyzing powers for population of all multiplets of states of ^{120}Sn (dots) homologous to the low-lying parent states of ^{119}In, including the fragmented level contributions, are compared with the cross sections and analyzing powers for the population of these ^{119}In states (solid lines): a) for the multiplet homologous to the ^{119}In 0.311 MeV level; b) for the multiplet homologous to the ^{119}In 0.604 MeV level; c) for the multiplet homologous to the ^{119}In 1.044 MeV level.