Spectroscopy of ^{110}Sn via (p,t) Reaction

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The Sn isotopes have been the object of many experimental and theoretical investigations aimed at understanding their shell model structure. To this aim we have measured, in a high resolution experiment, the ^{112}Sn(p,t)^{110}Sn reaction, using the 26 MeV proton beam from the Munich MP Tandem accelerator. The 102 μg/cm^2 thick ^{112}Sn isotopic enriched target was evaporated on a 13 μg/cm^2 carbon backing. The isotopic enrichment of the target was: ^{112}Sn 98.9 %, ^{114}Sn 1.0 %, ^{115,116}Sn $< 0.05\%$, ^{117,118,119,120,122,124}Sn $< 0.02\%$.

The reaction products were analyzed with the Munich Q3D spectrograph, from 6^o up to 57.5^o in two different magnetic field settings in order to reach an excitation energy of the residual nucleus of $\sim$ 4300 keV. The energy resolution was 8 keV full width at half maximum.

Outgoing tritons were identified in the focal plane of the Q3D magnetic spectrometer by the 1.8 m long focal plane detector for light ions. The energy calibration of the spectra was carried out using a polynomial of rank four, whose parameters were set by reproducing the excitation energies of eight levels determined in γ experiments [1] and identified in the present experiment. Absolute cross sections were estimated with an uncertainty of $\pm$15%. Areas and centroids of the tritons peaks were determined by means of the AUTOFIT shape fitting code [2] using as reference the shape of the triton peak at 3183 keV.

We have studied 27 (p,t) transitions to the final states of ^{110}Sn. The experimental angular distributions for several transitions to J$^\pi$= 0$^+$ and 2$^+$ states are reported in Fig.1 together with the theoretical curves obtained assuming a semimicroscopic dineutron cluster pick up mechanism. The DWBA calculations have been performed in a finite-range approximation using the computer code TWOFNR [3]. The used optical model parameters for the proton entrance channel and for the triton exit channel are the same reported in reference [4].

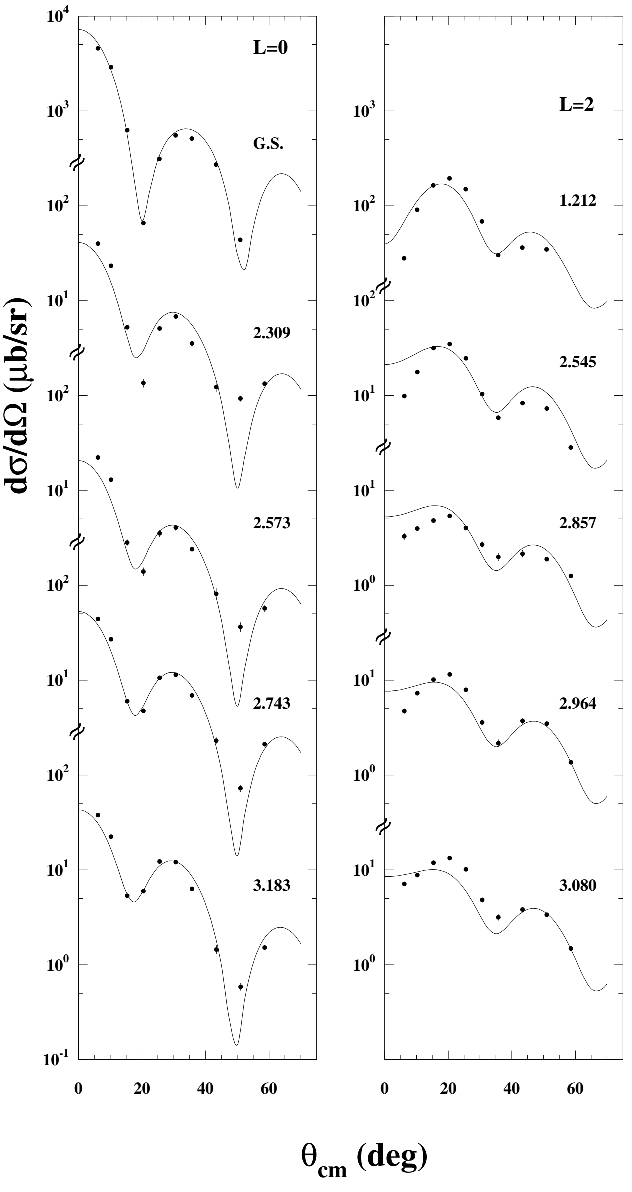

Fig. 1: Angular distributions of $\sigma(\theta)$ for some of the observed L=0 and L=2 transitions.

References

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