NEW 0+ STATES AND THEIR CORRESPONDENTS IN ODD N=82-85 Sm ISOTOPES IDENTIFIED THROUGH (p,t) REACTIONS

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In a systematical experimental search for 0+ states in even nuclei around the N=82 shell-closure and their correspondents in odd nuclei, we have studied the ¹⁴³Nd, ¹⁴⁴Sm (N=83), ¹⁴⁶Sm (N=84) and ¹⁴⁷Sm (N=85) nuclei through (p,t) reactions at $E_p = 26$ MeV, using the Q3D spectrometer of the University of Munich. Due to the high selectivity of the reaction, very low background, good energy resolution and pronounced L-dependence of the angular distributions, we could clearly identify 0+ states and ($0_+^{\text{exc}} \times \text{g.s.}$) configurations up to $E_{\text{exc}} = 4$ MeV and large level densities. In ¹⁴⁵Sm the correspondents of the 0+ excitations from ¹⁴⁴Sm were identified. In addition to the g.s. ($\nu 2f_{7/2}$) and the first 2 excited 7/2- states ($2^{+} \cdot f_{7/2}$ and $0^{+} \cdot f_{7/2}$), 13 other 7/2- states were found to share the ($0_+^{\text{exc}} \cdot f_{7/2}$) configurations and their mutual interaction matrix elements were extracted /I/. At least six new 0+ states have been identified in ¹⁴⁶Sm between 2 and 4 MeV and candidates for their correspondents have been found in ¹⁴⁷Sm. The number of 0+ states found exceeds the one predicted by the IBA-2 calculations for the same excitation energy range but is comparable with that found in the ¹⁴⁴Nd isotope.

A prominent result is that this type of experiments prove to be a very powerful method for the identification of high lying 0+ and other interesting low spin non-yраст states in nuclei, and can be used for the location of such exotic and long sought after configurations-like the two octupole phonons and two gamma-vibration phonons.


Fig. 1 Spectra at $\theta = 5^\circ$ and 17.5$^\circ$ (angular distribution maxima for $L=0$ and $L=2$, respectively) are subtracted to show the 0+ states (upper part) populated in the reaction ¹⁴⁶Sm(p,t)¹⁴⁴Sm.