RJPHY Research Journal of Physics

OPEN ACCESS

News & Comments

Developments in the Structure of Nuclei

Jenson Easo

The heaviest self-conjugate and doubly magic nucleus that is stable regarding heavy-particle emission is the nucleus ^{100}Sn, where N is the number of neutrons and Z is the atomic number. As such, it presents a good opportunity for shell-model investigations. It and its neighbours are especially well suited to study neutron-proton correlations based on the coupling of single-particle states regarding a doubly-magic-core due to their unique positions in the nuclei's periodic table. It has a direct bearing on the availability of these nuclei in any known manufacturing reaction and, consequently, on technological advancements in accelerators. This field has been greatly impacted by recent technology breakthroughs relating to it. It was initially projected that the electron capture (EC) decay energy (QEC) window in the entire chart of nuclei would contain the greatest value seen because of the Super Gamow-Teller transition, B(GT), from the ground state of ^{100}Sn. Since then, significant advancement has been made thanks to a recent theoretical discussion of the experimental value. The closed core's particle-hole excitations are the first potential excited yrast states in ^{100}Sn. There have been no reports of ^{100}Sn in stimulated states to date. An extensive amount of work has been put into calculations of the probabilities of -cluster formation and decay in ideal heavy emitters 104Te and the 212Po for a direct comparison, to directly address the structure of ^{100}Sn itself. This article is structured as follows and provides a quick summary of the most recent findings regarding the structure of excited states of nuclei in the ^{100}Sn area. Following a broad overview that includes ground-state features, the most effective experimental techniques for learning about exciting states in local nuclei are elaborated. A significant amount of work is put into experimental approaches to ensure development in this nuclear region that is extremely challenging to access. Several features of the advancements are essential. The requirement is the accessibility of accelerators with beam characteristics, such as energy and intensity, etc., that are ideal for a certain experimental setup. It is possible to separate and identify reaction products in flight once the beam energy reaches the range necessary for fragmentation reactions.

Experimental and theoretical groups from around the world have shown a lot of interest in studies of the ^{100}Sn region in recent years. This manifested in several publications over the past ten years as well as in current and pending proposals and now, a sizable amount of data that has not yet been reviewed. Two examples are given below to further promote a steady rate of development and the requirement for fresh knowledge of important nuclei and specific states. The first involves looking for excited states of ^{100}Sn, which can be discovered from the decay of the 6+ isomeric state anticipated.

JOURNAL REFERENCE

Górska M. Trends in the Structure of Nuclei near ^{100}Sn. Physics. 2022; 4(1):364-382

KEYWORDS
nuclear structure,shell model,magic nuclei,gamma-ray spectroscopy