

Exploring the possible two-proton radioactivity of $^{38,39}\text{Ti}$

Two-proton ($2p$) radioactivity represents a rare decay mode that has been experimentally observed only in a selected few nuclei. The exploration of $2p$ emission is crucial for elucidating the structure, mass, and nucleon-nucleon interactions within exotic proton-rich nuclei. ^{39}Ti has long been postulated as a potential candidate for $2p$ emission; however, experimental investigations have yet to confirm its $2p$ decay. To provide more accurate information for further studies, we utilize the Gamow shell model (GSM) and the Gamow coupled channel (GCC) method to analyze the prospective $2p$ radioactivity of isotopes $^{38,39}\text{Ti}$. Our calculations suggest that ^{39}Ti is indeed a viable candidate for $2p$ emission. Notably, the estimated partial $2p$ decay width for ^{39}Ti , predicted from the three-body GCC method, suggests that its $2p$ decay could rival its β decay in likelihood, although this is highly dependent on the specific $2p$ decay energy. Additionally, our analysis indicates a propensity for pairing between the valence protons in ^{39}Ti . A similar investigative approach reveals that ^{38}Ti exhibits a higher $2p$ decay energy and a broader decay width than ^{39}Ti , positioning it as a more promising candidate for $2p$ decay.

Research field of your presentation

Theoretical Low-energy nuclear physics

Author: Mr HUANG, Bo (Institute of Modern Physics, Fudan University)

Presenter: Mr HUANG, Bo (Institute of Modern Physics, Fudan University)