A Recoil-Beta Tagging Study of N=Z Nucleus ^{66}As

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A Recoil-Beta Tagging (RBT) experiment was recently performed in order to identify T=1 excited states in the medium-heavy N=Z=33 nucleus ^{66}As. The aim of this study was to yield information especially on the Coulomb energy differences (CED) between the T=1 isobaric analogue states of ^{66}As and ^{66}Ge. The CED can reveal various nuclear phenomena such as nucleon-nucleon pairing effects and shape co-existence. In the case of mirror nuclei, where the nuclei have inverse neutron and proton numbers the CED can be used to extract information about the proton-neutron (p-n) pairing interaction. The possible changes in the p-n pairing strength also have an influence on nuclear shapes. This leads to the concept of shape co-existence where the same nucleus can have either spherical, oblate or prolate shapes depending on the configuration of valence nucleons. In addition the information gained for excited states in the neutron deficient $A \sim 70$ mass region, adds to our understanding of the astrophysical rp-process.

The experiment was carried out at the University of Jyväskylä accelerator laboratory utilising the JUROGAM II γ-ray spectrometer in conjunction with the gas-filled recoil separator RITU and the GREAT focal plane spectrometer system. The ^{66}As-nuclei were produced via ^{28}Si(^{40}Ca,pn)^{66}As reaction at a beam energy of 75 MeV. This experiment was successful due to the technical developments in the measurement set-up. New 50 μm thick Mylar windows were installed for the multi-wire proportional counter, which allowed a higher gas pressure to be used in RITU, thereby improving the separation between the recoils of interest and beam like projectiles. The planar germanium detector was used to detect the beta particles as well as γ-rays.
A tentative level scheme for ^{66}As was reported by Grzywacz et al [1], [2]. The data obtained from this experiment reveals some discrepancies with the previous work. This presentation will discuss the most recent results regarding the ^{66}As, lightest nucleus ever studied at RITU.

References

[1] R. Grzywacz et al., Nucl. Phys. A 682 41 (2001)

[2] R. Grzywacz et al., Phys. Lett. B 429, 247 (1998)