DIRECT MASS MEASUREMENTS OF NEUTRON-RICH RUBIDIUM ISOTOPES

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In the study of nucleus properties near the border of nuclear stability it is very interesting to carry out direct mass measurements far from β-stability.

The main purpose of the present work is to receive new mass data for neutron-rich rubidium isotopes in the region of N=56 subshell. We have used a new mass measurement scheme which is based on the calibration of the mass scale with the help of the isobaric doublet method. The masses of neutron-rich rubidium isotopes have been determined by direct on-line mass spectrometry. The studied isotopes were produced in reactions induced by 1 GeV protons ($10^{12} s^{-1}$) in a uranium target (25 g of natural uranium). The intensity of the rubidium ion beam in the output ion guide of the mass separator was up to $10^8 s^{-1}$. The mass scale of the spectrometer was calibrated by means of reference isotopes Zr, Nb or Mo. The absolute mass uncertainties for these isotopes are about 2—3 keV and they are negligible in comparison with the uncertainties of the measured masses. The total number of detected ions was from 10^3 for ^{97}Rb to 10^5 for ^{91}Rb. The high resolution power M/ΔM=

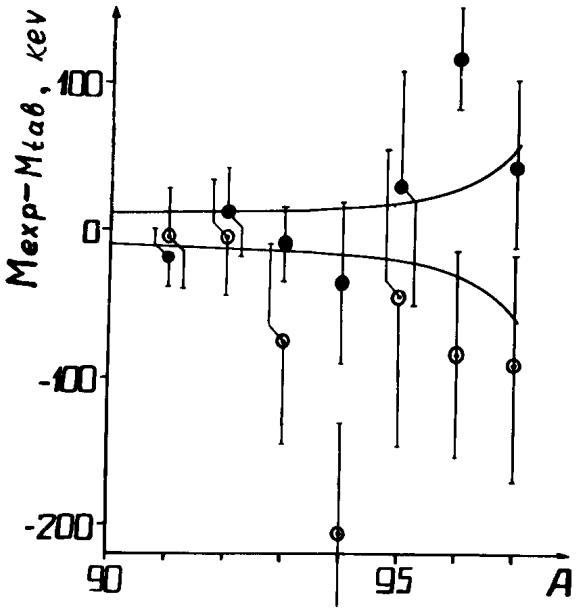

Fig. Difference between experimental and table (Wapstra et al., 1985) masses for rubidium isotopes.
● — present work using isobaric references;
○ — work /1/ using isotopic references.
Curve shows limits of table mass uncertainties

$=3\cdot10^4$ of the mass spectrometer gave an opportunity to resolve the mass lines of the rubidium isotopes and their stable isobars.

The experimental results derived from the measured mass spectra are presented in fig. The data obtained with two independent methods using different sets of reference masses are self-consisted within the experimental error limits with the exception of some separate cases (^{94}Rb and ^{96}Rb). This means that the measured mass values are free from any significant systematic uncertainties.

The two-neutron separation energies determined from the experimental data for ^{93}Rb and ^{94}Rb isotopes differ by about 100 keV from the data of work /1/. The difference between these energies defines the extent of the shell correction in the region of N=56 subshell. A more accurate mass determination needs more statistics.

REFERENCE

1. *Epherre M. et al.* Phys. Rev., C19. 1979. 1504.