Mass measurement of ^{100}Sn using the second cyclotron of GANIL

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During the last experiment, using the second cyclotron of GANIL (CSS2) as a high resolution spectrometer, the mass of ^{100}Sn has been measured :

$$M.E.(^{100}Sn) = -57.770 \pm 0.300(syst.) \pm 0.900(stat.)MeV$$

Simultaneously we reproduced the known mass excess [3] of ^{100}Cd ($-74.260 \pm 0.110MeV$) with a precision of $\sim$200 keV and we measured for the first time the mass of ^{100}In :

$$M.E.(^{100}In) = -64.650 \pm 0.300(syst.) \pm 0.100(stat.)MeV$$

This original method had shown excellent mass resolution (10^{-5}) for the simultaneous acceleration of light secondary ions [1,2].

The A=100 secondary ions were produced via a fusion-evaporation reaction, using a ^{50}Cr beam accelerated by the first GANIL cyclotron (CSS1) to 5.3 MeV/nucleon, incident on a rotating 1.2 mg/cm^2 thick ^{58}Ni target located between the two cyclotrons. The relative mass differences between the secondary ions ^{100}Ag^{22+}, ^{100}Cd^{22+}, ^{100}In^{22+} and ^{100}Sn^{22+} are less than 3×10^{-4}, and they can thus be simultaneously accelerated in CSS2. The accelerated ions were detected and identified inside the cyclotron using a Silicon detector telescope (ΔE 35μm, E_{xy} 300μm) mounted on a radially movable probe. The time-of-flight (phase) of the detected ions was measured relative to the radiofrequency.

We observed ^{100}Ag^{22+}, ^{100}Cd^{22+}, ^{100}In^{22+}, and 12 events of ^{100}Sn^{22+}. From the phases of the different isobars we can determine their masses, using the ^{100}Ag^{22+} as reference mass.

References:
1. G. Auger et al, Nouvelles du Ganil N°50 (1994) 7.
2. G. Auger et al, Nucl. Instr. Meth. A350 (1994) 235.
3. G. Audi and A. H. Wapstra, The 1993 Atomic Mass Evaluation,Nucl. Phys. A565 (1993) 1.