

PRODUCTION AND ACCELERATION OF HEAVY IONS WITH TUNIS-12UD SYSTEM AT THE UNIVERSITY OF TSUKUBA

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Heavy ions produced by TUNIS have been accelerated by the 12UD Pelletron tandem accelerator at the University of Tsukuba. Ion species available for ordinary experimental work are summarized in Table I. Ion currents indicated in the table are those measured by FC-2(see Fig.1), and they are not maximum obtainable values, but average values used for the experiments during the last one year. The currents were restricted mainly by the lifetime of stripper foils of the 12UD. Details of TUNIS have been published elsewhere^{1),2)}.

Table I. Ions supplied by TUNIS

| Ion species | Ion current (nA) | Cone material |
|-------------------------------|-----------------------|------------------|
| ¹² C ⁻ | 200 | graphite |
| ¹⁶ O ⁻ | 200 | Pyrex glass |
| ¹⁹ F ⁻ | 200 | CaF ₂ |
| ²⁸ Si ⁻ | 100 | Si |
| ³² S ⁻ | 100 | S |
| ³⁵ Cl ⁻ | 50 | NaCl |
| ⁵⁸ Ni ⁻ | 30 | Ni |
| ⁶³ Cu ⁻ | 30 | Cu |
| ⁷⁹ Br ⁻ | 30 | KBr |

Fig.1 illustrates schematically the TUNIS-12UD system. Ion beams from TUNIS are injected to the 12UD through an inflection magnet after the beams are deflected by a 30°-magnet, and are preaccelerated to 100 keV. The 30°-magnet eliminates electrons from target cones of TUNIS and prevents the preaccelerating tube from suffering from the electron loading. Beam currents are measured by Faraday-cups FC-1,-2, -3, and -4.

Efficiency of operation of the TUNIS-12UD system depend largely on the lifetime of the stripper foil. The foil is made of carbon and is prepared by the usual method of evaporation. Thickness of the foil is 5μg/cm². The average lifetime of the foil is more than 20 hours for 200 nA beams of 11 MeV oxygen ions, but is only 10 min for 30 nA of 11 MeV Au ions. Fig.2 shows the variation of transmission through the 12UD for Cu and Br beams. The transmission is defined by the ratio of current reads on FC-3 to FC-2, I(FC-3)/I(FC-2).

Fig.3 depicts the variation of transmission with energy and species of the incident ions. The transmission in this case is defined as I(FC-3)/I(FC-2)·q, where q is the average charge of ions in the high energy end of the 12UD.

References.

- 1) M.Yamanouchi, Y.Higashi, H.Yamaguchi, and M.Okamoto, Nucl. Instr. and Meth. 158(1979)339.
- 2) Y.Higashi, H.Yamaguchi and M.Yamanouchi, Nucl. Instr. and Meth. (to be published).

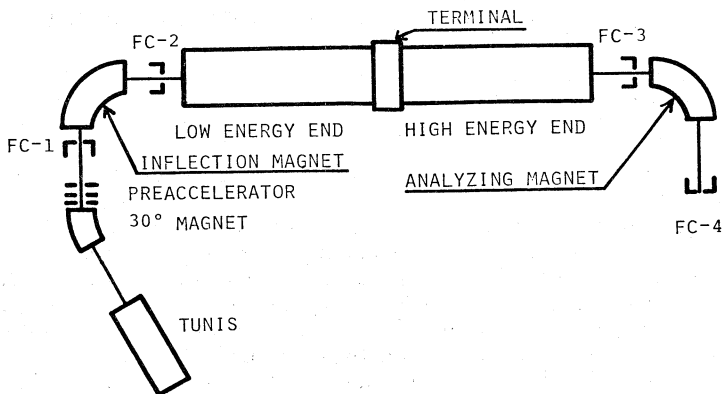


Fig. 1 Schematic View of TUNIS-12 UD System

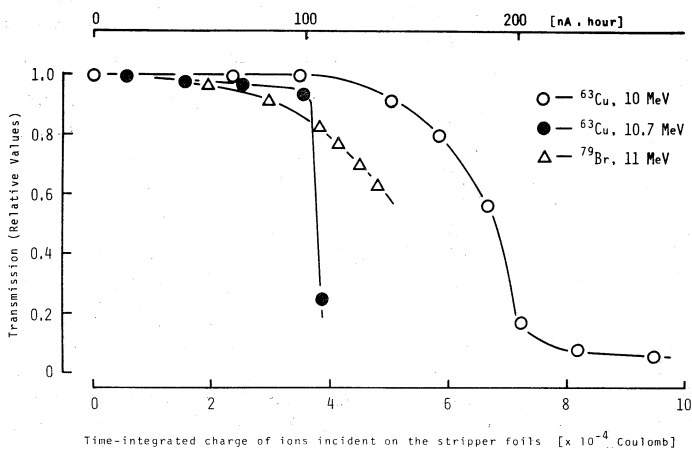


Fig. 2 Lifetime of Stripper Foils

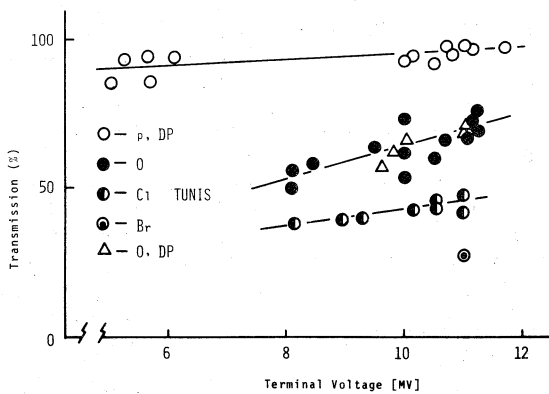


Fig. 3 Transmission of Ions through 12 UD