

## E. Radiopharmaceuticals

### Design Study of the Cyclotron for Exclusive Production of $^{123}\text{I}$

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There are many nuclear reactions for production of  $^{123}\text{I}$ . The cyclotron is applied  $^{123}\text{Sb}(h, 3n)^{123}\text{I}$  reaction and energy of  $3\text{He}^{++}$  is chosen 40 Mev. The specification is as following.

4 sector radial ridge AVF cyclotron,  
Magnet; B-constant pole profile, 92 cm  
diameter,  
Tow dee, 45 degree 50 kv, MOPA,  
2ed harmonic acceleration.

Intrenal target,

The performances is as folowing.

Eh 40 Mev, I 100  $\mu\text{a}$ ,  $^{123}\text{I}$  250 mCi/day,

Merits of the exclusive cyclotron are easy operation and small exposure radiation hazard on operators including chemical treatment.

If the use of  $^{131}\text{I}$  is prohibited, three or four exclusive cyclotrons will be installed in Japan.

### Fundamental Studies on Production of $^{123}\text{I}$

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Under the present condition of cyclotron in Japan, we studied on nuclear reaction, the target and the chemical separation of product with an aim to establish suitable technique for constant production of  $^{123}\text{I}$  of high radiochemical purity.

We think that the nuclear reaction of  $^{123}\text{Sb}(^3\text{He}, 3n)^{123}\text{I}$  is suitable. When the metallic Sb target of about  $140\text{ mg/cm}^2$  thickness is irradiated by the incidence energy of about 38 MeV, it is known that the rate of yield of  $^{123}\text{I}$  is good (about

$0.8\text{ mCi}/\mu\text{A-h}$ ) and the contamination of  $^{124}\text{I}$  is little ( $<3\%$ ). A thin plate of metallic Sb was used mainly as the target and we found that the target prepared by subliming Sb on the surface of metallic copper plate is much superior.

The irradiation was done by cyclotron of the Institute of Physical and Chemical Research.

The target was irradiated in beam current of 5–10  $\mu\text{A}$  for 3–5 hrs. We found that the following procedure is convenient for the chemical separa-