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## An Automated Production of $^{64}\text{Cu}$ on 18/9 MeV cyclotron

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**Objectives:** The reaction route  $^{64}\text{Ni}(p,n)^{64}\text{Cu}$  is very popular for the preparation of  $^{64}\text{Cu}$  because its entrance channel is accessible at low energies and yield of reaction is quite high. The objective is to develop a module for automated production of  $^{64}\text{Cu}$  at BIONT site.

**Methods:** Electrodeposition was performed in galvanostatic mode at current 10–100 mA. Electroplating was accomplished within 1.5–12 h. A thickness of Ni layer was determined

by calculation after weighing of Ni on a disk for 1.13 cm<sup>2</sup> area. A quality of surface layer was examined by SEM (scanning electron microscope). COSTIS target station was installed at the end of the external beam line of the IBA Cyclone 18/9 cyclotron. The target station has been equipped with 300 μm Nb window foil in the front of the target to degrade energy to energy

for nuclear energy less than 14 MeV. The homogeneous beam with area of 1.2 cm<sup>2</sup> with of 5 μA proton and energy less than 14 MeV was applied. An automated separation module for isolation of  $^{64}\text{Cu}$  equipped with PLC SIMATIC S7-1200 controller has been developed. The quality of  $^{64}\text{Cu}$  was checked by gamma spectrometry and chemical purity ( $^{64}\text{Ni}$ ) was determined by ICP-MS.

**Results:** The target was prepared by electrodeposition of nickel proceeds according to the Davison and Harrison [1] and Philip and Nicol [2] in ammoniacal solution at pH 9. Target was irradiated with current of 5 μA in the COSTIS target station.  $^{64}\text{Cu}$  production rate for 100 mg  $^{64}\text{Ni}$  of 99.09 % purity (ISO FLEX) on gold target was 104 MBq/μAh. The separation of  $^{64}\text{Cu}$  from the target was achieved by anion exchange chromatography with HCl as elution solution. The chemical purity of  $^{64}\text{Cu}$  product was checked by ICP MS and concentration of  $^{64}\text{Ni}$  was less than 2 ppm.

**Conclusions:** The procedure developed has been successfully applied for the routine production of no-carrier-added  $^{64}\text{Cu}$  from enriched  $^{64}\text{Ni}$  generated by the reaction  $^{64}\text{Ni}(p, n)^{64}\text{Cu}$  using a cyclotron 18/9. An automated separation module with PLC SIMATIC S7-1200 remote control has been constructed for the preparation of  $^{64}\text{Cu}$  with good radionuclide and chemical purity.

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**References:** [1] Davison W, Harrison JA (1972) The reduction of aqueous nickel ammine complexes. *J Electroanal Chem* 36:399–410, [2] Philip HI, Nicol MJ (1976) The electrodeposition of nickel from ammoniacal solutions, project report no. 1804. National Institute for Metallurgy, Randburg

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