PRODUCTION OF 14C-PELLETS FOR SPUTTER ION SOURCES

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The technology of the preparation of 14C-material for sputter ion sources in the form of C + Fe -pellets is developed.

Radioactive nuclei beams became an important tool for fundamental nuclear physics and begin to be used in the applications. For some long-lived nuclides the off-line production of a radioactive sample to be used in the accelerator ion source is possible. The advantage of this method is that all the parameters of the original beam are conserved and the experimental equipment may be not changed. In this paper the technology of the preparation of 14C-material for sputter ion sources in the form of C + Fe-pellets is developed. In some aspects it differs from the method published in [1]. The pellets were prepared from a mixture, which is expected to form cast-iron. The 17.3 mg of the enriched powder 14C were mixed thoroughly with 300 mg of high-purity iron powder. The mixing was produced in a device which was revolved in a magnetic field. The obtained balls were dried and baked in a vacuum at the temperature ~ 700-800 deg.C. Then the balls were fused by electron beam healting in a vacuum better than 7.10^{-8} torr. Non standart type electronic gun (Fig.1) with a water cooled copper crucible and an accelerating voltage of 20 kv was used.

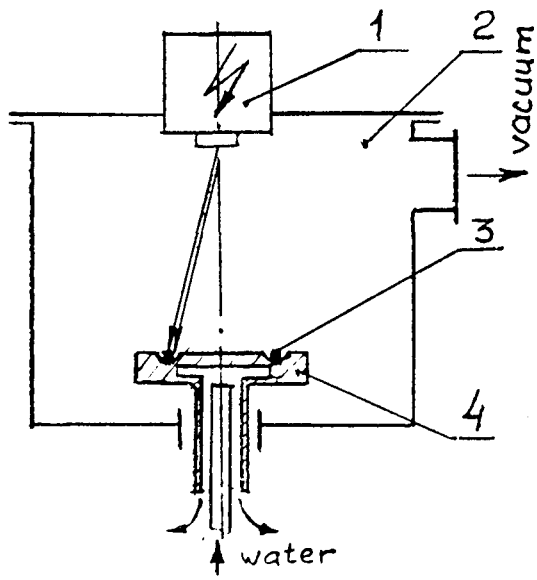

Fig.1. The scheme of the electronic beam gun set up.
1. The electronic beam gun
2. The chamber
3. The balls of Fe - C
4. A water cooled crucible

The prepared pellets had a spherical form of a ~4-5 mm diameter and metallic appearance. By additional centrifugal melting with an electron beam cylindrical pellets were produced as well.
The pellets a mechanically stable. More than 99% of radiation is absorbed in the pellet. The pellets are very convenient for the transportation and handling.
The pellets have been tested at the VICKSY-accelerator, Berlin. Different isotops of single negative charge have been separated after the ion source with a magnatic analysis. The maximum current obtained for 14C was about 1.5 μA. One pellet was used in an experiment for elastic scattering studies; currents of 5-20 nA were used during 8 days of beam time.
The 14C-beam provided some new possibilities in various directions of nuclear physics research.

1) The information about isospin dependence of nucleus-nucleus potentials was obtained from the study of the elastic scattering of two isobar nuclei on the same target with $Tz \neq 0$ [2].

2) For study neutron-rich nuclei the double charge-exchange reaction (14C,14O) occured to be perspective:
The measurement of the mass excess and exited states of 13Be nucleus and also of the structure of 14Be nucleus were done [3].
Besides the discovery of the 10He nucleus was confirmed [4].

References.

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