

PREPARATION OF THE SOLDER ON THE BASIS OF ARCHAEOLOGICAL LEAD FOR LOW BACKGROUND EXPERIMENTS

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Modern experiments with aim of investigation or search of ultra-rare events, for example neutrino or dark matter interaction within a low background detector, place high demands for the radiation purity of the materials used, even for those used in small quantities. These include materials used for soldering elements in detector systems, i.e. a solder and flux. Radioactive purity of the materials is crucially important since their location in a close proximity to the detector's body inside of the shields. Radionuclide purity of commercial solders does not meet the requirements because they are made of natural lead which contains the radioisotope ^{210}Pb ($T_{1/2} = 22.3$ y.) on a level of 1 ± 100 Bq/kg.

In this paper we report on the preparation of solder with the composition: 60% Sn and 40% Pb, made from marketable tin with a chemical purity of 99.9999% [1] and raw archaeological Roman lead [2]. The investigation of the chemical purity of archaeological lead was performed in [3]. Two ingot tin-lead solders with a mass of 100 grams each were produced. In addition, for comparison of measurements, a sample of the same weight was made from commercial lead with a chemical purity of 99.9999% and high-purity tin. The solder fabrication work was carried out in a specially equipped clean room in JINR (Dubna), and measurements of the solder radioactivity levels were carried out in the Modane underground laboratory using a low-background HPGe detector Obelix.

1. Tin with chemical purity 99.9999% purchased from the "URAL-OLOVO" metallurgical company.
2. Michel L'Hour // Rev. Archéol. de l'Ouest. V.4. 1987. P.113.
3. Petr S. Fedotov et al. // Talanta. V.192. 2019. P.395.

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