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Data analysis from catcher foil experiment for measurement of cross sections of fusion reaction leading to Hg isotopes.

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nbsp;nbsp;nbsp;nbsp;Yields from the complete fusion reaction of 40Ar + 144Sm => 184-xnHg were measured by the catcher foil method [1] (on the U400M cyclotron at the Flerov Laboratory of Nuclear Reactions). Cross sections for neutron channels of complete fusion were calculated from measured yields. The catchers were made out of five aluminum foils (0,8 μm thick) stacked downstream from the target. The experiment was carried out in repetitive short cycles (10 s). The foils were periodically moved from the beam position to the detector position. Data from the detector were analyzed to obtain α-spectra of implanted isotopes.
nbsp;nbsp;nbsp;nbsp;The talk will be focused on the data analysis of the above mentioned reaction. As a rule, the α-particle spectra produced in these types of experiments have a very complicated structure. The problem of resolving them into separate lines attributed to specific decaying nuclides can be rather complicated. To make it easier, new software written in LabVIEW was developed. It allows one to calculate the cross sections of the reaction studied by taking into account all essential corrections: half-life and α-decay probability of the registered isotopes, and also the influence of measurement cycles. Geometric efficiency of the detectors was simulated using GEANT4 software. The current of the incident ion beam was measured. The energy of the ion beam from the cyclotron was decreased by a degradation foil upstream of the target. Straggling of the ion beam in both the degradation foil and the target itself were experimentally measured.Measured energy dispersion was higher than what theory predicted. Therefore, deconvolution of the incident excitation function was applied on the obtained results. Experimental results were compared with theoretical excitation functions from the channel coupling model.
nbsp;nbsp;nbsp;nbsp;Experimental results were compared with results obtained on the MASHA setup (Mass Analyzer of Super-Heavy Elements) [2] to allow estimation of time and separation efficiency of mass spectrometer MASHA.

1. D.Vermeulen, H.Clerc et al., "Cross sections for evaporation residue production near the N=126 shell closure,"Z Physik A 318, 157–169 (1984).
2. A.M.Rodin et al., "MASHA separator on the heavy ion beam for determining masses and nuclear physical properties of isotopes of heavy and 'indent 4 spaces'superheavy elements,"Instruments Exp. Tech. 57, 386–393 (2014).

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