RADIOCHEMICAL NEUTRON ACTIVATION ANALYSIS BASED MULTI-ELEMENTAL ANALYSIS OF HIGH PURITY GALLIUM

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Gallium is one of the widely used materials in semiconductor and optoelectronics industry. Gallium is used to produce infrared detectors, piezoelectric sensors, high- and low-temperature transistors for space and defense technology. One of the most important requirements for semiconductor materials of gallium compounds is an excessive high purity for layers and films. Information on impurities (type of an impurity, concentration, character of distribution) is important as for better understanding of the physical and chemical processes taking place in formed semiconductor structures and for the "know-how" of devices on their basis.

The object of this work is to develop radiochemical neutron activation technique for analysis of high purity gallium.

Irradiation of 0.1 g of gallium sample in neutron flux of $5 \cdot 10^{13}$ $cm^{-2}s^{-1}$ for 5 hours will result in induced activity of more than 10^8 Bq, due to ^{72}Ga radionuclide, half-life of which is 14.1 hours. Therefore to perform instrumental NAA of gallium long period (10 day) cooling is required, and high sensitive determination of elements producing short- and long-lived radionuclides ($T_{1/2} < 2$ days) becomes impossible.

The radiochemical variant NAA of gallium provides separation of radionuclides of trace elements from ^{72}Ga. We have studied the behavior of gallium in extraction-chromatographic system "TBP-HCl". The experiments have shown that higher factor of distribution (D) and capacity on gallium can be achieved when "TBP-4M HCl" system is used. However more than 10 trace elements have high D and thus they cannot be separated from ^{72}Ga. To resolve the problem and increase the number of separated trace elements we have used preliminary satisfaction of chromatographic column with tellurium, which has D higher than the most of elements in "TBP-4M HCl" system and thus suppresses extraction of elements. Distribution profile of gallium along the column and elution curve of 25 trace elements have been measured. Chemical yields of separated elements measured by using radiotracers are more than 93%.

On the basis of the carried out researches the radiochemical technique of NAA for high purity gallium has been developed. The technique uses extraction-chromatographic separation and allows to determine up to 25 elements with LD $n \cdot 10^{-5}$-$n \cdot 10^{-9}$ % mass with Sr 0.15-0.2

MODERNIZED SPECTROMETER FOR THE HYDROGEN CONTENTS ANALYSIS IN SAMPLES

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Determination of the concentration profiles of the hydrogen isotopes in various materials is very actual problem now since hydrogen, if presents, rather strongly affects on physical,