

NONSTATIONARY ISOTOPE TRANSFER DUE TO CHANGE OF SEPARATION CASCADE FLOWS

Ushakov A. A.^{1,2}, Orlov A. A.¹, Sovach V. P.²

¹National Research Tomsk Polytechnic University, 634050, Tomsk, Lenin str., 30

²Joint Stock Company «Production Association «Electrochemical Plant»,
663690, Zelenogorsk, Pervaya promyshlennaya, 1
e-mail: ushakovaa2015@sibmail.com

During the operation of gas centrifuge (GC) cascade for the multicomponent isotope mixture (MIM) separation there are nonstationary processes. One of the most frequent origins of nonstationary processes is change of cascade outgoing flow rate (light or heavy fraction). Research of these processes is of interest for determination laws of isotope concentration change.

This article contains the research results for nonstationary isotope transfer in GC cascade caused by the change in values of outgoing cascade flows (light or heavy fraction). The research considers the case of germanium isotopes that are applied in production of semi-conducting materials (^{72}Ge), research of neutrinoless double β -decay (^{76}Ge) and as a starting material for arsenic radioactive isotopes (e. g. ^{70}Ge is used to obtain radioactive ^{72}As).

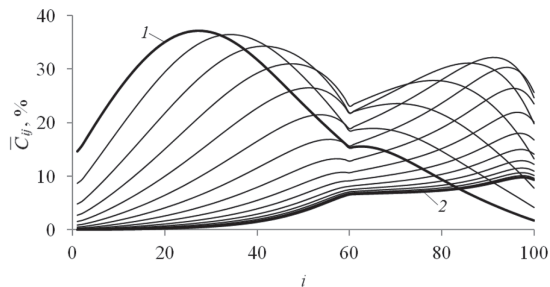


Fig. 1. Changing of ^{73}Ge weight-average concentration on cascade stages during nonstationary process: 1 — initial state; 2 — final state

It is shown that during the nonstationary process the concentration of the ^{70}Ge and ^{76}Ge isotopes changes monotonically in the light and heavy fraction flows regardless of the final values of these flows. It has been established that the concentrations of isotopes with an intermediate mass number in the light and heavy fraction flows can be beyond the range limited by the initial and final values, and even exceed the maximum achievable values for the three-flow cascade at the steady-state mode.