MODELING OF EXCHANGE SEPARATION PROCESSES ON SOLID-PHASE COMPOUNDS

L.I. Dorofeyeva, E.A. Boretsky, E.S. Titov

National Research Tomsk Polytechnic University,

Russia, Tomsk, Lenina Avenue, 30, 634050

E-mail: eab18@tpu.ru

The isotopes separation problem, which is applied in many areas of a science and technics, has great value for the nuclear industry, in connection with growing needs in highly enriched isotopes. The works carried out in the given direction, are based on studying new effective separation technique and using ion-exchange materials which meet the requirements on ecological safety of production.

Modeling of isotopes separation process, in the given work, was carried out to study the influence of selective properties of cationites, kinetic characteristics, and a process realization method on separation efficiency. Practical value and application spheres of inorganic ion-exchangers are caused, first of all, by their high selectivity, chemical, thermal and radiating stability, i.e. the properties profitably distinguishing them from organic ion-exchange resins [1]. Zeolites are the most widespread group among natural origin sorbents. There are about 40 kinds of minerals. The opportunity of selection and synthesis inorganic ion-exchangers with the set of properties are practically inexhaustible. Inorganic compounds of many classes as sorbents can be used and capable to absorb ions from solutions due to various types of sorptive interactions, and also modern methods of synthesis and modifying of inorganic sorbents allow to vary their properties over a wide range.

When using selective ion-exchangers, the factor of isotope separation considerably increases. As a rule, selectivity is defined by type ionogenic groups, cross-linkage number and pores size of ion-exchangers. At exact conformity of the pores size to radius aquated ion sieving effect is shown. Isotopes separation of alkaline elements was carried out by the frontal advance method and ion-exchange elution chromatography. On inorganic sorbents [2] the increase in isotope enrichment factor up to 0,0127 is received.

Influence of kinetic characteristics on isotopes separation process in counterflow system with counter movement of phases [3] is investigated. Admissible change ranges of moving phases speeds on a ion-exchange column are determined. Optimum flow ion-exchangers velocity average 0,04 sm/s, ion-exchangers phases - 0,07 sm/s. The concentration rate value under the given realization conditions of process and depending on type of a selective material changes in a range 1,021 … 1,092.

The results received in work can be used at the enterprises of isotopes separation and fine purification substances.

REFERENCES

1. Jaroslavzev A.B. Ion exchange on inorganic sorbents // Progress of Chemistry. – 1997– т. 66– №7– P. 641–660.
2. Research of selective properties inorganic exchangers / I.A. Tikhomirov, A.P. Vergun, L.I. Dorofeyeva. VINITI, 28.02.01, № 2330 – B99.
3. Vergun A.P., Dorofeyeva L.I., Vergasov K. A. Electroregeneration ion-exchanger at isotope separation in exchange counterflow columns. // Materials All-Russia scientific and technical conf., in 5 - Krasnoyarsk, 1999. - P. 190-191.