

耐久性アミノ酸樹脂を用いる炭酸ウラニル捕集と同位体分離濃縮に関する研究

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Studies on the recovery of uranyl carbonate and the concentration of the isotopes using durable amino acid resins

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エネルギー学一般・原子力学

Research Institution

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Uranyl carbonate / Amino acid resins / Collection capacity / Uranium isotopes

Research Abstract

1. Synthesis of durable amino acid resins and the resin properties : We have synthesized 15 types of amino acid resin, introducing amino acids or imitative amino acids into polystyrene resin by the active esterification method. Amino acid contents introduced were estimated to be about 2-3.7 mmol/g-resin and the resin properties were evaluated by the measurement of ion exchange capacity, water content, FT-IR and etc.. We also

investigated a washing effect with acids, alkali soaking and repeated use of the resins, and clarified that the developed resins were durable and functional ones.

2. Collection capacity of uranium and the selective adsorption function : The resins showed high adsorptive activity toward carbonate species of uranium. The equilibrium adsorption amounts were more than 950mg U/g-resin in Gly and Arg resins, and the high functionalization of amino acid resin was performed. The adsorption rate was exceedingly rapid and the mechanism was interpreted to be Langmuir type adsorption of dicarbonate uranyl species by the analysis of the adsorption isotherms. The protonated amino residue may behave as a driving force for adsorptions, whose function was confirmed by the introduction of iminative amino acids possessing steric hindrance in amino group. Effect of carbonate concentration and sea water matrixes, and the behaviors of break-through and elution using mobile phase were also examined, and the developed resins were proved to be a selective adsorbent for uranium.

3. Separation and concentration behaviors for uranium isotopes : The separation behaviors of natural uranium isotopes were traced by the resin contact using batch method. The separation factor ($^{234}\text{U}/^{238}\text{U}$) of each resin was accumulated by the measurement of alpha-ray. We found clearly that the isotope concentration effect largely emerged from the contact with carbonate species at high temperature condition (90°C). The effect of ester-bonding type resins developed formerly was larger than that of amido-bonding types. It suggests that the oxidation-redox action of amino acid within the resin behaves as an acceleration factor of the separation. Some factors were 300 times or more against those of the equilibria in solution. Although the factors of $^{235}\text{U}/^{238}\text{U}$ were measured by ICP-MS method, we could not perform wholly the meaning evaluation, due to large errors at the measurements. However, we found the resins possessing the factors 20 times or more against those of the solution equilibria. Accordingly, the developed resins can be expected for the application to the contact systems with multistage separations.▲ Less

Research Products (4 results)

All Other

All Publications (4 results)

[Publications] 上田一正,他3名: "耐久性アミノ酸樹脂を用いる海水ウランの捕集と分離" Bull.Chem.Soc.Jpn.(発表予定). ▼

[Publications] 上田一正,他3名: "アミノ酸樹脂によるウラン同位体の分離挙動" Bull.Chem.Soc.Jpn.(発表予定). ▼

[Publications] K.Ueda, Y.Michigami and etc.: "Studies on the recovery of uranyl carbonate and the concentration of the isotopes using durable amino acid resins" Bull. Chem. Soc. Jpn.(to be published). ▼

[Publications] K.Ueda, Y.Michigami and etc.: "Separation behaviors of uranium isotopes using amino acid resins" Bull. Chem. Soc. Jpn.(to be published). ▼

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