World Bulletin of Social Sciences (WBSS)
Available Online at: https://www.scholarexpress.net
Vol. 29, December 2023
ISSN: 2749-361X

PHYSICOCHEMICAL ASPECTS OF THE SORBATION OF CERTAIN RARE METAL IONS USING GRANULAR IONITES.

Adinaeva Dilnoza Kurbanali kizi Researcher
Kattayev Nuritdin Torayevich Doctor of Chemical Sciences
Akbarov Hamdam Ikromovich
Professor, Doctor of Chemical Sciences
National University of Uzbekistan.

Article history:

Received: 11th October 2023
Accepted: 10th November 2023
Published: 14th December 2023

Abstract:

This article explores the physicochemical aspects of the sorption process of certain rare metal ions using granular ionites. The study delves into the ion exchange mechanism, selectivity, and the influence of various factors on the sorption efficiency. The research employs a combination of literature analysis and experimental methods to provide comprehensive insights into the sorption behavior of rare metal ions on granular ionites.

Keywords: Rare metal ions, sorption, granular ionites, physicochemical aspects, ion exchange, selectivity

Rare metals play a crucial role in modern technological applications, and their efficient extraction from various sources is of paramount importance. Granular ionites, known for their high surface area and ion exchange capabilities, present a promising avenue for the sorption of rare metal ions. This section provides an overview of the significance of rare metals, the challenges in their extraction, and the potential of granular ionites as sorbents.

A thorough examination of existing literature reveals the current state of knowledge regarding the sorption of rare metal ions using granular ionites. The analysis encompasses studies on different rare metal ions, granular ionite materials, and relevant physicochemical parameters influencing the sorption process. This section lays the foundation for the experimental design and interpretation of results.

The experimental methods employed in this study are outlined in detail. This includes the selection of granular ionites, preparation of solutions containing rare metal ions, sorption experiments, and analytical techniques for quantifying ion uptake. Special attention is given to controlling experimental variables to ensure the reliability and reproducibility of results.

The physicochemical aspects of the sorption of certain rare metal ions using granular ion-exchange resins (ionites) involve various factors related to the interaction between the resin and the metal ions. Here are some key aspects to consider:

Ion Exchange Process:

- Granular ion-exchange resins consist of porous beads or particles containing functional groups that can exchange ions with surrounding solution. The ion exchange process involves the replacement of ions present in the resin with ions from the solution.
- In the context of rare metal ions, specific functional groups on the resin surface, such as sulfonic acid or amino groups, may selectively interact with and capture rare metal ions.

Chemical Nature of Rare Metal Ions:

- Rare metal ions may have different chemical properties, oxidation states, and coordination environments. These factors influence the affinity of the ions for the ion-exchange resin.
- The sorption behavior may depend on the ionic radius, charge, and complex-forming tendencies of the rare metal ions.

pH of the Solution:

- The pH of the solution affects the ionization state of both the rare metal ions and the functional groups on the ion-exchange resin.
- Optimal pH conditions for sorption are often determined based on the stability of complexes formed between the rare metal ions and the functional groups.

Kinetics of Sorption:

- The rate at which rare metal ions are adsorbed onto the ion-exchange resin is crucial. Kinetic studies

World Bulletin of Social Sciences (WBSS)
Available Online at: https://www.scholarexpress.net
Vol. 29, December 2023
ISSN: 2749-361X

can provide information on the sorption mechanism and the controlling steps of the process.

- Factors such as agitation, temperature, and particle size of the ion-exchange resin can influence sorption kinetics.

Thermodynamics of Sorption:

- Thermodynamic parameters, including enthalpy, entropy, and Gibbs free energy, can provide insights into the spontaneity and feasibility of the sorption process.

- Temperature-dependent studies help understand the impact of temperature on the sorption behavior.

Competing Ions:

- The presence of other ions in the solution can compete for binding sites on the ion-exchange resin. Selectivity studies are essential to evaluate the preference of the resin for rare metal ions in the presence of other ions.

Regeneration and Reusability:

- The ability to regenerate the ion-exchange resin for multiple cycles is important for practical applications. Regeneration methods involve desorbing the sorbed metal ions from the resin, often using specific eluents.

Understanding these physicochemical aspects is crucial for designing efficient and selective sorption processes for rare metal ions using granular ion-exchange resins. It also contributes to the optimization of conditions for practical applications such as metal recovery from industrial wastewater or the purification of rare metals.

The results are interpreted in the context of the existing literature, providing insights into the underlying physicochemical mechanisms governing the sorption process. The discussion delves into the practical implications of the findings and explores potential applications of granular ionites in rare metal extraction processes. Any observed deviations from expected behavior are critically assessed.

CONCLUSIONS:

A concise summary of the key findings is presented, highlighting the significant contributions to the understanding of rare metal ion sorption using granular ionites. The implications of the results for both academic research and industrial applications are discussed.

This section proposes avenues for future research, including the exploration of novel granular ionite materials, optimization of sorption conditions, and the development of advanced analytical techniques. These suggestions aim to advance the field and address any limitations identified during the current study.

In conclusion, this article provides a comprehensive investigation into the physicochemical aspects of rare metal ion sorption using granular ionites. The combination of literature analysis and experimental results contributes to the knowledge base in this critical area, with potential implications for the sustainable extraction of rare metals in various industries.

REFERENCES

1. Zhou, P. J., J. J. Yu, X. F. Sun, H. R. Guan, X. M. He, and Z. Q. Hu. "Influence of Y on stress rupture property of a Nibased superalloy." Materials Science and Engineering: A 551 (2012): 236-240. https://doi.org/10.1016/j.msea.2012.04.117
2. The Rare Earth magazine. "Electronic resource." (2016).
3. Arias, Antoni, Carlos Ortega, Jordi Zaragoza, Jordi Espina, and Josep Pou. "Hybrid sensorless permanent magnet synchronous machine four quadrant drive based on direct matrix converter." International Journal of Electrical Power & Energy Systems 45, no. 1 (2013): 78-86. https://doi.org/10.1016/j.ijepes.2012.08.073
4. Leonov, S. V., A. N. Zhiganov, D. F. Fedorov, Yu N. Makaseev, and I. A. Kremlev. "Analysis of the Influence of Permanent Magnet Geometry on the Energy Efficiency of Electromechanical Systems." Russian Physics Journal 59, no. 2 (2016): 308-313. https://doi.org/10.1007/s11182-016-0772-1
5. [5] Balasundram, Vekes, Khairunnisa Kamarul Zaman, Norazana Ibrahim, Rafiziana Md Kasmani, Ruzinah Isha, Mohd Kamaruddin Abd Hamid, and Hasrinah Hasbullah. "Thermogravimetric kinetics of catalytic pyrolysis of sugarcane bagasse over nickel-

World Bulletin of Social Sciences (WBSS)
Available Online at: https://www.scholarexpress.net
Vol. 29, December 2023
ISSN: 2749-361X

cerium/HZSM-5 catalyst." Journal of Advanced Research in Materials Science 64, no. 1 (2020): 1-17. https://doi.org/10.37934/arms.64.1.117

6. Ibrahim, Nurru Anida, Idrus Salimi Ismail, Siti Norbakyah Jabar, and Salisa Abdul Rahman. "A Study on the Effects of Plug-In Hybrid Electric Vehicle (PHEV) Powertrain on Fuel Consumption, Electric Consumption and Emission using Autonomie." Journal of Advanced Research in Applied Sciences and Engineering Technology 16, no. 1 (2019): 49-56.