

IWS 2. Exploring scandium ores processing technology: Techniques, challenges, and applications

Objective:

This assignment aims to familiarize students with the processing of scandium ores, the specific technologies used in scandium extraction, and the unique challenges associated with this rare metal. By completing this assignment, students will gain an understanding of the full processing chain, from ore to final product, and the significance of scandium in modern technology.

Instructions:

1. Introduction to Scandium

- Provide a brief overview of scandium, including its properties, uses, and significance in modern industries (e.g., aerospace, electronics, and fuel cells).
- Discuss the rarity of scandium ores and why scandium is considered a critical element.

2. Sources of Scandium

- Identify and describe the major scandium-bearing ores (e.g., thortveitite, bauxite residue, lateritic nickel-cobalt ores).
- Explain the global distribution of scandium deposits and the primary regions where scandium mining occurs.

3. Scandium extraction techniques

- **Leaching:**
Explain the process of leaching in scandium extraction, focusing on acid and alkaline leaching methods. Include the typical reagents used and the challenges associated with each method.
- **Solvent extraction:**
Describe how solvent extraction is used to separate scandium from other elements. Highlight the importance of choosing appropriate solvents and the impact of impurities on the extraction process.
- **Ion exchange and precipitation:**
Discuss the role of ion exchange and precipitation in purifying scandium. Provide examples of common precipitating agents and resins used.
- **Calcination and refining:**
Outline the final steps in the scandium processing chain, including calcination and refining, leading to the production of high-purity scandium oxide or scandium metal.

4. Case studies

- Select and analyze a real-world case study of scandium extraction and processing, such as projects in Australia, China, or Russia.
- Discuss the specific techniques used, the challenges faced during processing, and the economic and environmental implications of the project.

5. Challenges in scandium processing

- Explore the technical challenges involved in scandium ore processing, such as low ore grades, energy consumption, and the handling of radioactive by-products.
- Discuss the environmental concerns related to scandium mining and processing, including waste management and water usage.

6. Future prospects and innovations

- Investigate recent advancements in scandium processing technology, including new extraction methods, recycling initiatives, and the potential for scandium recovery from industrial waste streams.
- Reflect on how innovations in scandium processing could influence the availability and use of this metal in the future.

7. Conclusion

- Summarize the key insights gained from the assignment.
- Reflect on the importance of scandium processing technology in supporting emerging technologies and the challenges that need to be addressed.

Format:

- Word count: 2000-2500 words
- Font: Times New Roman, 12 pt
- Line spacing: 1.5
- Include references and citations.

Submission Date:

07.10.2024 (6th week)

Assessment Criteria:

- Content Accuracy and Depth: 40%
- Clarity and Organization: 20%
- Case Study Analysis: 20%
- Creativity and Innovation: 10%
- Proper Referencing: 10%