



Research Highlights

लिथियम-पेग्माटाइट अयरस्क प्रक्रम-अपशिष्ट से रुबिडियम, सीज़ियम और पोटैशियम का निक्षालन द्वारा प्रतिप्राप्ति

लिथियम-युक्त पेग्माटाइट प्रसंस्करण अपशिष्ट का मूल्यवर्धन

Leach Recovery of Rubidium, Caesium and Potassium from a Lithium-Pegmatite Ore Process Residue

Value Addition to Lithium-Bearing Pegmatite Processing Residue

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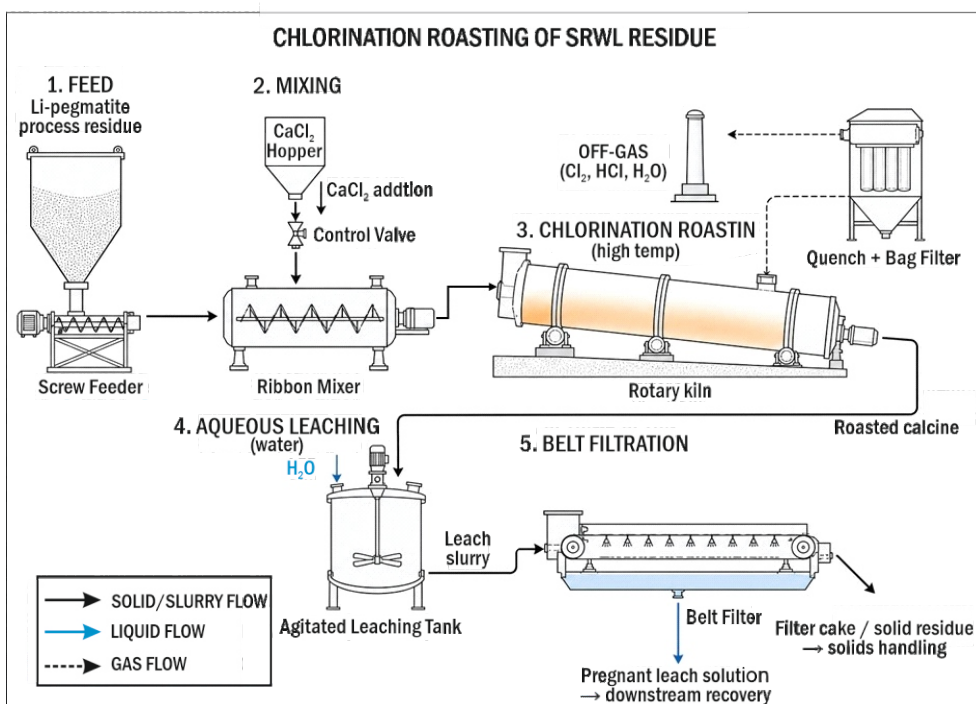
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Rubidium (Rb) and caesium (Cs) are strategically important metals used in atomic clocks, night-vision systems and aerospace technologies. Potassium (K), in contrast, is consumed on a much larger scale, predominantly in the fertilizer sector. India's dependence on imported potash highlights the importance of developing indigenous K resources and recovering associated Rb and Cs from a process residues enriched in these metals. In the present study, a sulphation-roasted-water-leached residue of lithium-bearing pegmatite ore was investigated as a secondary source of these alkali metals. The material contained 0.41 wt% Rb, 0.11 wt% Cs and 4.14 wt% K, principally hosted in microcline, leucite and nepheline. A chlorination roasting-water leaching route using calcium chloride dihydrate ($\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$) was developed to convert these framework-bound alkali metals into water-soluble chlorides.

Chlorination of the alkali-bearing aluminosilicate phases by addition of calcium chloride is found thermodynamically favorable, with the driving force increasing with temperature. Process parameter optimization studies showed that above a critical dosage, hydrolysis of calcium chloride promotes wollastonite formation by reacting with silica, reducing the amount of chlorinating reagent available for alkali-metal extraction and yielding only marginal additional gains. X-ray diffraction confirmed the transformation of the alkali-bearing phases and the formation of calcium aluminosilicate and calcium silicate products. Maximum leachabilities of 95% Rb, 93% Cs and 87% K were obtained by roasting at elevated temperature using $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$, followed by plain-water leaching, enabling simultaneous recovery and a basis for selective separation. The findings support indigenous resource development and improved supply-chain security of the strategically important alkali metals.



Reference:

[1] V. Atchutanna, R. Sinha, K. Anand Rao, T. S. R. C. Murthy and T. Sreenivas, "Chlorination roasting and aqueous leaching of Rb, Cs, and K from the sulphation-roasted-water-leached metallurgical residue of Li-bearing pegmatite ore," Hydrometallurgy, 245 (2026) 106880. DOI: 10.1016/j.hydromet.2026.106880.

About the author



Ms. Atchutanna Vidyaadhari is currently working as a Scientific Officer/C in Bhabha Atomic Research Centre's Mineral Processing Division stationed at Hyderabad.

Her research focuses on mineral beneficiation and hydrometallurgy-based processing of atomic and critical metals, including uranium, rare earths, and alkali metals recovery. She is the gold medalist of the 67th batch in Metallurgy at BARC Training School.

Schematic representation of calcium chloride dihydrate assisted chlorination of alkali bearing aluminosilicates to form water soluble Rb, Cs and K chlorides [1].